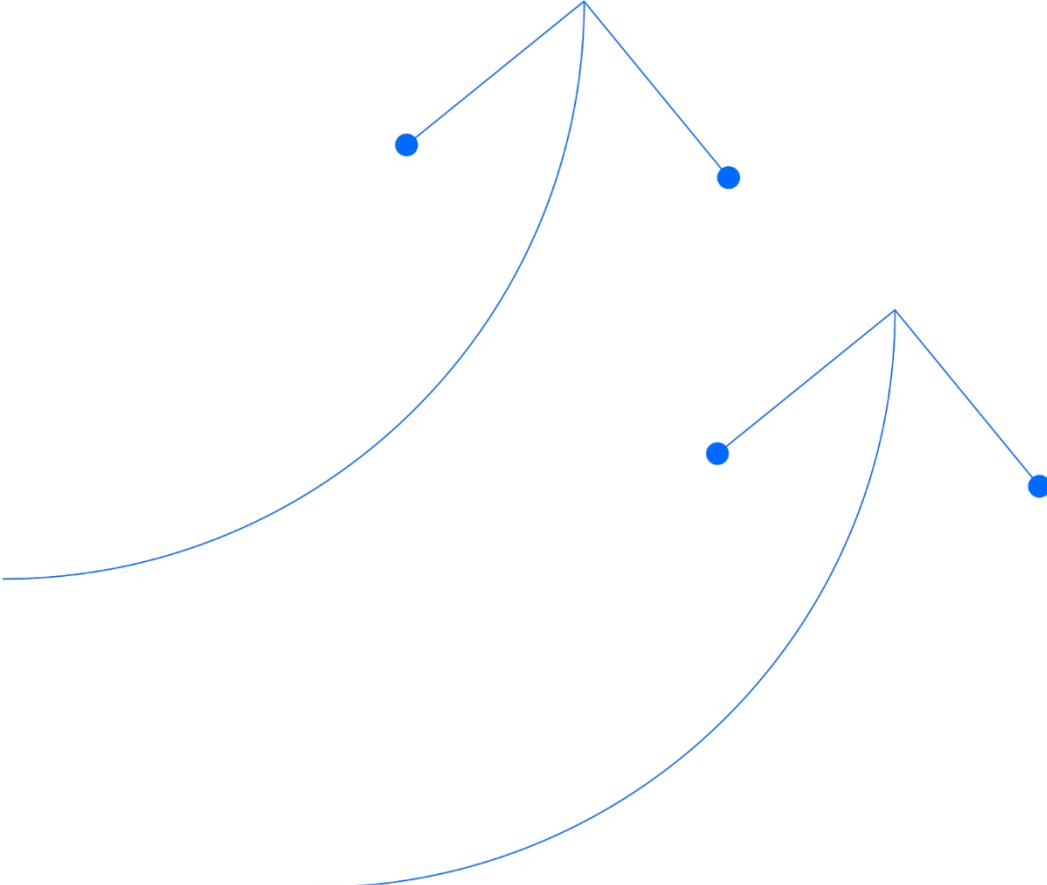




Van Gogh Coniston Novara VGA-4H GI ST1 Well Decommissioning Oil Pollution Emergency Plan

February 2026

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1. Quick Reference Information

Parameter	Description	Further Information									
Petroleum Activity	<p>The VGA-4H GI ST1 well will either be suspended using a dynamically positioned (DP) LWIV or decommissioned using a MODU (moored or DP). In either case, the objective is to return the VGA-4H GI ST1 well to two-barrier status. If suspension using a LWIV is undertaken, the well will need to be decommissioned, which would occur at a later date as part of the VGCN overall well decommissioning campaign, which is subject to separate regulatory approvals.</p> <p>Operations will be undertaken within a 2,500 m radius of VGA-4H GI ST1 subsea well in ~360–380 m water depth.</p>	EP Section 2									
Location	<p>The VGCN field is located approximately 285 km west-south-west of Dampier and 60 km north of Exmouth in production licence WA-35-L.</p> <p>The activities covered by this EP will occur in an Operational Area which is defined as within a 2,500 m radius of VGA-4H GI ST1 subsea well which is located in 367 m of water at 21° 23' 52.186" South, 114° 04' 04.147" East.</p>	EP Section 2.1.1									
Petroleum title/s (Blocks)	WA-35-L	N/A									
Vessels	<p>LWIV or semi-submersible MODU</p> <p>Up to 3 supply vessels, which could be anchor handling supply vessels (AHSV's), platform supply vessels (PSV's) or a combination of the two.</p>	EP Section 2.1									
Water Depth	Water depth ranges from 360-380 m	N/A									
	<table border="1"> <thead> <tr> <th>Scenario</th> <th>Hydrocarbon</th> <th>Worst-case Volume</th> </tr> </thead> <tbody> <tr> <td>Loss of well control causing crude release</td> <td>Van Gogh Crude</td> <td>8,073 m³</td> </tr> <tr> <td>Surface spill from vessel collision</td> <td>MDO</td> <td>325 m³</td> </tr> </tbody> </table>	Scenario	Hydrocarbon	Worst-case Volume	Loss of well control causing crude release	Van Gogh Crude	8,073 m ³	Surface spill from vessel collision	MDO	325 m ³	Section 6.1
Scenario	Hydrocarbon	Worst-case Volume									
Loss of well control causing crude release	Van Gogh Crude	8,073 m ³									
Surface spill from vessel collision	MDO	325 m ³									
Worst-case spill scenarios											
Hydrocarbon properties	<p>Van Gogh Crude: Density at 15 °C = 961 kg/m³ Dynamic viscosity = 662 cP @ 20 °C API Gravity = 15.7 Wax content = <5% Pour point = -15 °C Oil property classification = Persistent - heavy (Group 4)</p> <p>MDO: Density at 15 °C = 890.0 kg/m³ Dynamic viscosity = 14.0 cst @ 25 °C API Gravity = 27.5 Wax content = 1% Pour point = -9.0 °C Oil property classification = Light persistent (Group II)</p>	Appendix A									
Weathering Potential	<p>Van Gogh Crude: Van Gogh Crude is a heavy crude oil with a relatively high degree of persistence in the marine environment irrespective of environmental conditions. Approximately 90% of Van Gogh Crude is predicted to remain on the surface after 24 hours. The mass on the surface is predicted to drop to approximately 74% after 7 days, with the decrease evenly balanced between evaporation and decay. The persistent, residual, component accounts for 61.7% of the whole oil mass. Van Gogh Crude is categorised as a Group 4 heavy-persistent oil.</p> <p>MDO: Under constant winds (~2.5 m/s), 36.1% of the MDO is predicted to evaporate within 24 hours. The remaining MDO on the water surface will weather at a slower rate and be subject to more gradual decay through biological and photochemical processes. Approximately 24 hours into the spill under variable winds (1-12 m/s), the forecast indicates that 80.5% of the MDO will have</p>	Appendix A									

Parameter	Description	Further Information
	<p>entrained, with an additional 15.0% expected to have evaporated. Hence, only a <1% of floating oil remains on the water surface. The low volatile and residual compounds are anticipated to entrain beneath the surface under conditions generating wind waves (winds approximately >6 m/s).</p> <p>While the MDO is entrained, it is forecast to decay at a higher rate of 3% per day or 21% after 7 days, attributed to biological and photochemical degradation. This is in contrast to a rate of 0.14% per day and a total of ~1% after 7 days for the constant-wind case. Given the proportion of entrained MDO and its tendency to remain mixed in the water column, the remaining hydrocarbons are expected to undergo decay over several weeks.</p>	
<p>Protection Priorities</p>	<ul style="list-style-type: none"> • Barrow Island • Lowendal Islands • Montebello Islands • Muiron Islands • Northern Islands Coast 	<p>Section 6.5</p>

2. First-Strike Response Actions

The initial spill response actions to oil spill incidents related to the MODU are under the direction of the Emergency Commander - this role will be fulfilled by the Offshore Installation Manager (OIM).

If the spill is from a vessel, initial response actions to oil spill incidents will be undertaken by the relevant Santos Company Site Representative or Vessel Master, and in accordance with vessel-specific procedures (e.g. Shipboard Oil Pollution Plans [SOPEPS]).

Following initial actions undertaken by the Emergency Commander / Vessel Master to ensure the safety of personnel, and to control the source of the spill, the Emergency Commander / Vessel Master will assess the situation based on:

- What has caused the spill?
- Is the source under control?
- What type of hydrocarbon has been spilled?
- How much has been spilled?

Response information contained within this Oil Pollution Emergency Plan (OPEP) is concerned primarily with a large scale (Level 2/3) hydrocarbon spill, where the Perth-based Incident Management Team (IMT) is engaged for support and implementation of response strategies. Level 1 spills are managed through on-site response and the IMT is available to assist with regulatory requirements/notifications and support if required. Therefore, the immediate response actions listed in Table 2-1 are relevant for any spill.

Once sufficient information is known about the spill, the Incident Commander at the Perth-based IMT will classify the level of the spill. If the spill is classified as a Level 1 spill, then the actions related to Level 2/3 spills do not apply, unless specified by the Incident Commander.

Table 2-1: First-strike activations

When (Indicative)	Activations		Who
	Objective	Actions	
All Spills			
Immediate	Manage the safety of personnel	Implement site emergency response procedures or vessel-specific procedures, as applicable	Emergency Commander/Vessel Master
Immediate	Control the source using site resources, where possible	Control the source using available on-site resources (vessel/MODU) Refer to source control plan – Section 9	Emergency Commander/Vessel Master
30 minutes of incident being identified	Notify Santos Offshore Duty Manager/Incident Commander	Verbal communication to Offshore Duty Manager/Incident Commander's duty phone	Emergency Commander/Vessel Master
As soon as practicable	Obtain as much information about the spill as possible	Provide as much information to the IMT (Incident Commander or delegate) as soon as possible	Emergency Commander/Vessel Master
60 minutes of incident being identified	Gain situational awareness and begin on-site spill surveillance	Level 1 spills may only require the use of onsite resources to conduct monitor and evaluate activities (e.g. vessel surveillance). Refer to Monitor and Evaluate Plan – Section 10	Emergency Commander/Vessel Master Incident Commander (Perth-based IMT)
Refer to timeframes in Section 7	Make regulatory notifications within regulatory timeframes	Activate the External Notifications and Reporting Procedures – Section 7	Initial notifications by Planning Section Chief – Section 7
Level 2/3 spills (in addition to actions above)			
Immediately once notified of spill (to Incident Commander)	Activate IMT, if required	Notify IMT	Offshore Duty Manager/ Incident Commander
<2 hours	Gain situational awareness and begin tracking of the spill	Deploy tracking buoy(s) from activity MODU/ vessel	Emergency Commander / Vessel Master
IMT actions (0 to 48 hours)			
Within 90 minutes from IMT call-out	Set up IMT room	Refer to IMT tools and checklists for room and incident log set-up	Incident Commander IMT Data Manager
	Gain situational awareness and set incident objectives, strategies and tasks	Begin reactive Incident Action Planning process Refer to Section 8 Review First-strike Activations (this table)	Incident Commander Planning Section Chief
Refer to timeframes in Section 7	Make regulatory notifications as required. Notify and mobilise/put on standby external oil spill response organisations and support organisations, as required.	Refer to Section 7	Initial notifications by Planning Section Chief Oil Spill Response Organisations (Australian Marine Oil Spill Centre [AMOSC] and Oil Spill Response Ltd [OSRL]) activation by

When (Indicative)	Activations		Who
	Objective	Actions	
			designated call-out authorities (Incident Commanders/Duty Managers)
Refer to timeframes in Section 10	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making	Vessel Surveillance (Section 10.1) Aerial Surveillance (Section 10.2) Tracking Buoys (Section 10.3) Oil Spill Trajectory Modelling (OSTM) (Section 10.4) Satellite imagery (Section 10.5)	Operations Section Chief Logistics Section Chief/ Supply Unit Leader Environment Unit Leader
Activate on Day 1 as applicable to the incident	Source control support to stop the release of hydrocarbons into the marine environment. **Degree of IMT support will be scenario-dependent**	Activate the source control plan. Refer to Section 9	Operations Section Chief (Source Control Branch Director as appropriate to scenario) Logistics Section Chief/ Supply Unit Leader
Activate on Day 1 as applicable to the incident Refer to Section 11 and Section 13	Reduce exposure of shorelines and wildlife to floating oil through mechanical / chemical dispersion	Activate the Mechanical and/or Chemical Dispersion Plan Refer to Section 11 and Section 13	Operations Section Chief Logistics Section Chief/ Supply Unit Leader
Activate on Day 1 as applicable to the incident Refer to Section 17	Assess and monitor effectiveness of response strategies and potential impacts from spill and response	Activate the North West Shelf Operational and Scientific Monitoring – Bridging Implementation Plan (OSM-BIP) (7715-650-ERP-0002) Refer to Section 17	Environment Unit Leader Logistics Section Chief/ Supply Unit Leader Operations Section Chief
Activate on Day 1 as applicable to the incident Refer Section 12	Implement containment and recovery tactics to reduce the volume of surface hydrocarbons to reduce contact with protection priorities	Activate the Containment and Recovery Plan Refer to Section 12	Operations Section Chief Logistics Section Chief / Supply Unit Leader
Day 1	Identify environmental sensitivities at risk and conduct operational Net Environmental Benefit Analysis (NEBA)	Review situational awareness and spill trajectory modelling Review strategic NEBA and begin operational NEBA (Section 6.6)	Environment Unit Leader
Day 1	Develop forward operational base/s to support forward operations	Begin planning for forward operations base as per Forward Operations Plan (Appendix O)	Operations Section Chief Logistics Section Chief/ Supply Unit Leader
Day 1	Ensure the health and safety of spill responders	Identify relevant hazards controls and develop hazard register Begin preparation Site Health and Safety Management requirements Refer Oil Spill Response Health and Safety Management Manual (7710-670-PLA-0019)	Safety Officer

When (Indicative)	Activations		Who
	Objective	Actions	
If/ when initiated Refer Section 14	Protect identified shoreline protection priorities	Activate the Shoreline Protection and Deflection Plan Refer to Section 14	Operations Section Chief Logistics Section Chief/ Supply Unit Leader Environment Unit Leader
If/ when initiated Refer Section 16	Prevent or reduce impacts to wildlife	Activate the Oiled Wildlife Response Plan Refer to Section 16	Environment Unit Leader Operations Section Chief Logistics Section Chief/ Supply Unit Leader
If/ when initiated Refer Section 15	Clean-up oiled shorelines	Activate Shoreline Clean-Up Plan Refer to Section 15	Operations Section Chief Logistics Section Chief/ Supply Unit Leader
If/when initiated Refer Section 18	Safely transfer, transport and dispose of waste collected from response activities.	Activate the Waste Management Plan. Refer to Section 18	Operations Section Chief Logistics Section Chief/ Supply Unit Leader
IMT Actions (48+ hours)			
Ongoing	<ul style="list-style-type: none"> For ongoing incident management (indicatively 48 + hours) a formal incident action planning process is to be adopted to continue with spill response strategies identified above. An Incident Action Plan (IAP) is to be developed for each successive operational period. Santos will maintain control for those activities for which it is the (designated Control Agency/ Lead IMT). Depending on the specifics of the spill, the Australian Maritime Safety Authority (AMSA) and/or Western Australia (WA) Department of Transport and Major Infrastructure (DTMI) may be relevant Control Agencies (refer to Section 4.1). Where another Control Agency has taken control of aspects of the response, Santos will provide support to that Control Agency. Santos' support to WA DTMI (for a WA State waters response) is detailed in Section 4.6 	Control Agency IMT Santos to provide the following roles to DTMI Maritime Environmental Emergency Coordination Centre (MEECC) / IMT for WA State waters response (refer to Table 5-6) <ul style="list-style-type: none"> Crisis Management Team (CMT) Liaison Officer Deputy Incident Controller Deputy Intelligence Officer Deputy Planning Officer Environment Support Officer Deputy Public Information Officer Deputy Logistics Officer Deputy Waste Management Coordinator Deputy Finance Officer Deputy Operations Officer Deputy Division Commander - FOB. 	

3. Introduction

This document is the accompanying Oil Pollution Emergency Plan (OPEP) to the Van Gogh Coniston Novara VGA-4HG1 Well Intervention / Plug & Abandonment Environment Plan (EP) ([7745-236-EMP-0001]) required by Regulation 35(4) and Regulation 22(8) of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (OPGGs(E)R).

3.1 Description Of Activity

Santos WA PVG Pty Ltd. is preparing to suspend or decommission the VGA-4H GI ST1 well within the Van Gogh Coniston Novara (VGCN) field (Production Licence WA-35-L). The well is located in Commonwealth waters approximately 285 km WSW of Dampier and 60 km north of Exmouth, Western Australia. The water depth in the fields ranges from approximately 360 m – 380 m.

The VGA-4H GI ST1 well will either be suspended using a dynamically positioned (DP) light well intervention vessel (LWIV) or decommissioned using a mobile offshore drilling unit (MODU) (moored or DP). Both the LWIV and MODU will require support vessels and helicopters. Both activities may also include an ROV vessel for pre, during and/or post campaign work.

Refer to Section 2 of the VGA-4H GI ST1 Well Decommissioning EP for detailed description of the activity.

3.2 Purpose

The purpose of this OPEP is to describe Santos' response to a hydrocarbon spill during the VGA-4H GI ST1 Well Decommissioning activities.

This OPEP has been developed to meet all relevant requirements of the Commonwealth OPGGS(E)R. It is consistent with the National and State (WA) systems for oil pollution preparedness and response, being the National Plan for Maritime Environmental Emergencies (AMSA 2020) managed by AMSA; and the WA State Hazard Plan for Maritime Environmental Emergencies (SHP-MEE) (WA DoT 2024a).

This OPEP is to be read in conjunction with the VGA-4H GI ST1 Well Decommissioning activity EP ([7745-236-EMP-0001]) when considering the existing environment, environmental impacts, risk management, performance standards and the reporting compliance requirements.

This OPEP will apply from acceptance of the EP and will remain valid for the duration of the life of the EP (5 years), as per the revision requirements.

The response strategies outlined in this OPEP have been developed by Santos using risk assessments to identify credible worst-case hydrocarbon spill scenarios, expected/calculated release rates, known information of hydrocarbon types and behaviour, and expected partitioning of the hydrocarbons within the marine environment with an estimate of the volume of persistent oil. This information has been modelled to give a theoretical zone of dispersion that is used to identify potential sensitive receptors and response strategies required to reduce the consequences of a spill to 'as low as reasonably practicable' (ALARP). The response strategies are identified under a net environmental benefit analysis (NEBA) process so the most effective response strategies with the lowest environmental consequences can be identified, documented and prepared for.

3.3 Objectives

The aim of this OPEP is to provide detailed guidance to Santos' IMT, so that it will direct its response effort with the aim of preventing long-term significant environmental impacts by safely limiting the adverse environmental effects from an unplanned release of hydrocarbons to the marine environment to a level that is ALARP. This will be achieved through the implementation of the various strategies and spill response mechanisms presented throughout this OPEP. Through their implementation, Santos will:

- initiate spill response immediately following a spill
- establish source control as soon as reasonably practicable to minimise the amount of oil being spilt into the environment
- assess the spill characteristics and understand its fate in order to be able to make informed and clear response decisions
- monitor the spill to identify the primary marine and coastal resources requiring protection

- remove as much oil as possible from the marine environment while keeping environmental impacts from the removal methods to ALARP
- reduce the impacts of the remaining floating and stranded oil to ALARP
- respond to the spill using efficient response strategies that do not damage the environment themselves
- comply with all relevant environmental legislation when implementing this OPEP
- conduct all responses safely without causing harm to participants
- monitor the impacts from a spill until impacted habitats have returned to baseline conditions
- remain in a state of 'Readiness' at all times for implementation of this OPEP by keeping resources ready for deployment, staff fully trained and completing response exercises as scheduled
- keep stakeholders informed of the status of the hydrocarbon spill response to aid in the reduction of social and economic impacts.

3.4 Area of Operation

The VGCN fields are located approximately 285 km WSW of Dampier and 60km north of Exmouth in production licence WA-35-L as shown in Figure 3-1. Water depths in the VGCN fields range from 360 m to 380 m. The activities covered by this EP will occur within 2,500 m radius of VGA-4H GI ST1 subsea well which is located in 367 m of water at 21° 23' 52.186" South, 114° 04' 04.147" East.

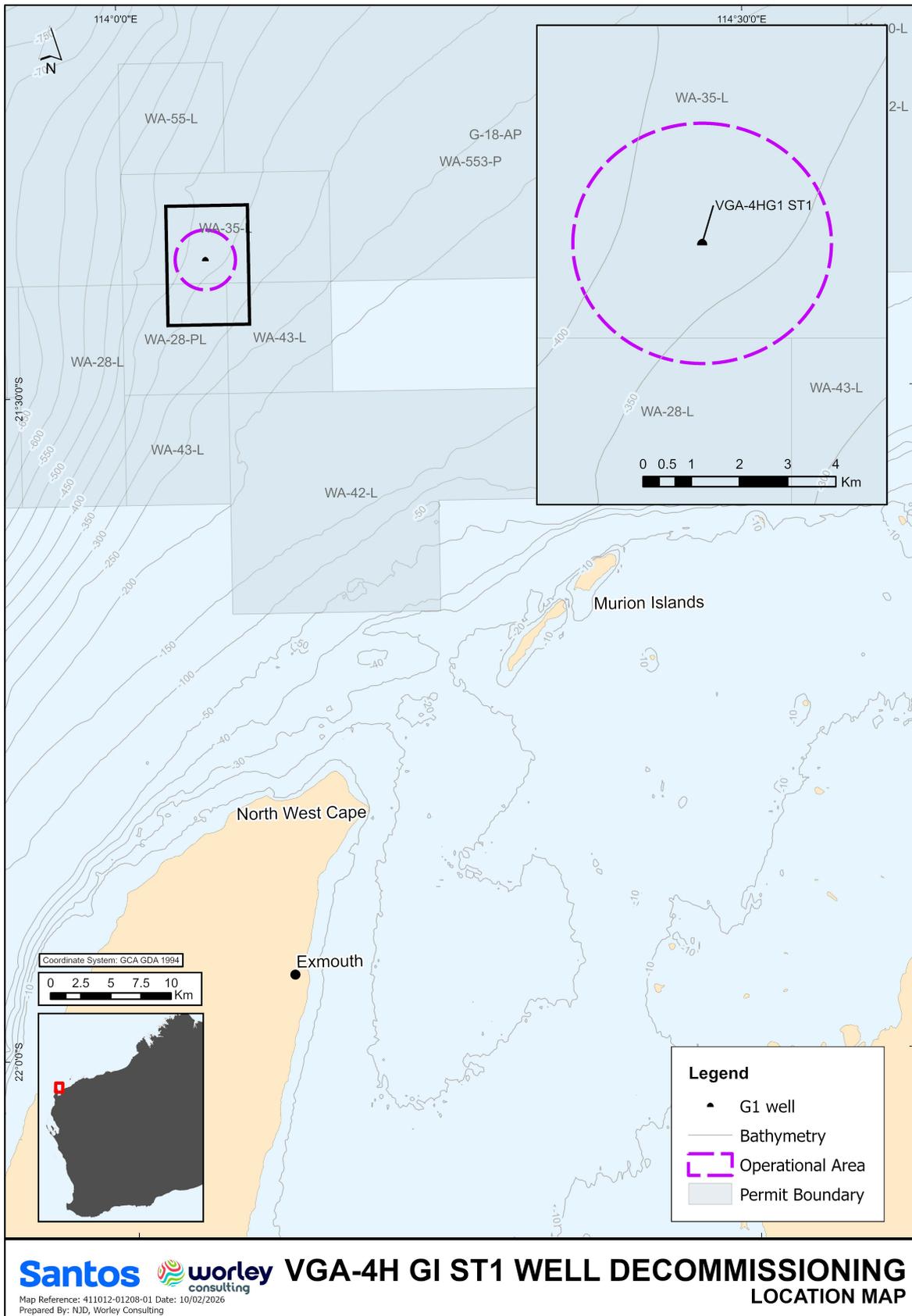


Figure 3-1: Location Map

3.5 Interface with Internal Documents

In addition to this OPEP, a number of other Santos documents provide guidance and instruction relevant to spill response, including:

- Incident Management Plan – WANATL (7700-670-PLA-0016).
- Santos Incident Management Handbook.
- Incident Response Telephone Directory (7700-670-PLA-0016.20).
- Santos Crisis Management Plan (SMS-HSS-OS05-PD03).
- VGA-4H GI ST1 Well Decommissioning EP [7745-236-EMP-0001]
- MODU Operator’s Emergency Response Plan.
- Santos-MODU Operator Emergency Response Bridging Document.
- Refuelling and Chemical Management Standard (SO-91-IQ-00098).
- Santos Offshore Source Control Planning and Response Guideline (DR-00-OZ-20001).
- Well-specific or campaign Source Control Plan.
- Oil Pollution Waste Management Plan (7715-650-ERP-0001).
- Oil Spill Response Health and Safety Management Manual (7710-670-PLA-0019).
- Santos Safe Working Practice (SWP): Site Entry Protocol in Oil Spill Response - Gas Monitoring.
- Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017).
- Santos Oiled Wildlife Sample Collection Protocol.
- Santos North West Shelf Operational and Scientific Monitoring – Bridging Implementation Plan (OSM-BIP) (7715-650-ERP-0002)
- Oil Spill Scientific Monitoring Baseline Data Review (7700-650-EMP-0005).
- WANATL Incident Management Training & Exercise Plan (7700-294-DIN-0005).
- Santos Offshore Division Oil Spill Response Readiness Guideline (7710-650-GDE-0001).
- Santos Oil and Water Sampling Procedures (7710-650-PRO-0008).
- Santos Marine Vessel Requirements for Oil Spill Response (7710-650-ERP-0001).
- Santos Oil Spill Response – Forward Operating Base Guideline (7700-670-PRO-0092).

3.6 Interface with External Documents

Information from the following external documents have been used or referred to within this OPEP:

- AMOS Plan – Australian Industry Cooperative Spill Response Arrangements
 - details the cooperative arrangements for response to oil spills by Australian oil and associated industries.
- Offshore Petroleum Incident Coordination Framework
 - provides overarching guidance on the Commonwealth Government’s role and responsibilities in the event of an offshore petroleum incident in Commonwealth waters.
- National Plan for Maritime Environmental Emergencies and National Marine Oil Spill Contingency Plan
 - sets out national arrangements, policies and principles for the management of maritime environmental emergencies. The plan provides for a comprehensive response to maritime environmental emergencies regardless of how costs might be attributed or ultimately recovered.
- Western Australia State Hazard Plan for Maritime Environmental Emergencies (SHP-MEE)
 - details the management arrangements for preparation and response to a marine pollution incident occurring in State waters.
- WA DTMI Incident Management Plan – Marine Oil Pollution

- provides the WA DTMI, as the hazard management agency (HMA) for marine oil pollution (MOP), with an incident management plan that outlines the procedures and arrangements for responding to MOP incidents occurring within or impacting WA State waters
- DTMI's Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements ([Offshore Petroleum Industry Guidance Note](#)).
- Western Australia Oiled Wildlife Response Plan
 - establishes the framework for responding to potential or actual wildlife impacts in WA waters, within the framework of an overall maritime environmental emergency
 - outlines risk reduction strategies, preparedness for, response to and initiation of recovery arrangements for wildlife impacts during a marine oil pollution incident.
- Western Australia Oiled Wildlife Response Manual
 - a companion document to the Western Australia Oiled Wildlife Response Plan for Maritime Environmental Emergencies, designed to standardise operating procedures, protocols and processes for wildlife response.
- Joint Industry Operational and Scientific Monitoring Framework
 - provides a standardised approach to oil pollution monitoring, including industry guidance, templates, worked examples and standardised Operational and Scientific Monitoring Plans which titleholders can apply to identify and detail monitoring arrangements and capabilities in their EP and OPEP submissions.
- Shipboard Oil Pollution Emergency Plans
 - under International Convention for the Prevention of Pollution from Ships (MARPOL) Annex I requirements, all vessels of over 400 gross tonnage are required to have a current SOPEP. The SOPEP includes actions to be taken by the crew in the event of an oil spill including steps taken to contain the source with equipment available onboard the vessel.
- OSRL Associate Member Agreement
 - defines the activation and mobilisation methods of OSRL spill response personnel and equipment allocated under contract.
- Australian Government Coordination Arrangements for Maritime Environmental Emergencies:
 - provides a framework for the coordination of Australian Government departments and agencies response to maritime environmental emergencies.
- Pilbara Port Authority Port of Dampier Handbook (Pilbara Ports Authority, 2024) (<https://www.pilbaraports.com.au/about-pilbara-ports/publications/forms-and-publications/forms-and-publications/handbook/2024/february/port-of-dampier-handbook>)
 - defines the requirements for marine oil pollution reporting within the Port of Dampier limits.
- Pilbara Port Authority Port of Ashburton Handbook (Pilbara Ports Authority, 2022) (<https://www.pilbaraports.com.au/about-ppa/publications/forms-and-publications/forms-publications/handbook/2022/may/port-of-ashburton-port-handbook>)
 - defines the requirements for marine oil pollution reporting within the Port of Ashburton limits.
- Pilbara Port Authority Port of Varanus Island (VI) Handbook (<https://www.pilbaraports.com.au/about-ppa/publications/forms-and-publications/forms-publications/form/2021/july/port-of-varanus-island-port-handbook>)
 - defines the requirements for marine oil pollution reporting within the Port of VI limits.
- Pilbara Ports West Marine Pollution Contingency Plan (MPCP) (<https://www.pilbaraports.com.au/about-ppa/publications/forms-and-publications/forms-publications/form/2021/july/pilbara-ports-west-marine-pollution-contingency-pl>)
 - Provides a source of information for individuals and agencies responsible for developing and managing oil spill response capabilities within Pilbara Ports West port limits.
- Barrow Island Port Information Manual (<https://australia.chevron.com/-/media/australia/our-businesses/documents/barrow-island-port-information-manual.pdf>):
 - Defines the requirements for marine oil pollution reporting within Barrow Island Port limits.

3.7 Document Review

In line with regulatory requirements, this document shall be reviewed, updated and submitted to NOPSEMA every 5 years from date of acceptance.

The document may be reviewed and revised more frequently, if required, in accordance with the Santos Management of Change Procedure (EA-91-IQ-10001). This could include changes required in response to one or more of the following:

- when major changes have occurred that affect oil spill response coordination or capabilities
- changes to the Environment Plan that affect oil spill response coordination or capabilities (e.g. a significant increase in spill risk)
- following routine testing of the OPEP if improvements or corrections are identified
- after a Level 2/3 spill incident.

The extent of changes made to the OPEP and resultant requirements for regulatory resubmission will be informed by the relevant Commonwealth regulations, i.e. the OPGGS(E)R.

The custodian of the OPEP is the Santos Lead Oil Spill Risk & Planning based in the Santos Perth office.

4. Spill Management Arrangements

4.1 Response Levels and Escalation Criteria

Santos uses a tiered system of three incident response levels consistent with the National Plan for Maritime Environmental Emergencies (National Plan) (AMSA 2020) and the WA SHP- MEE (WA DoT 2024a). Spill response levels help to identify the severity of an oil spill incident and the level of response required to manage the incident and mitigate environmental impacts. Incident response levels are outlined within the Santos Incident Management Plan – WANATL (7700-670-PLA-0016) and further detailed in Table 4-1 for hydrocarbon spills.

Table 4-1: Santos oil spill response levels

Level 1	
<p>An incident which will not have an adverse effect on the public or the environment which can be controlled by the use of resources normally available on site.</p>	
<ul style="list-style-type: none"> Oil is contained within the incident site. Spill occurs within immediate site proximity. Incident can be managed by the On-site Emergency Response Team (ERT) and its resources. 	<ul style="list-style-type: none"> Source of spill has been contained. Oil is evaporating quickly and no danger of explosive vapours. Spill likely to naturally dissipate. No media interest/not have an adverse effect on the public.
Level 2	
<p>An incident that cannot be controlled by the use of on-site resources alone and requires external support and resources to combat the situation; or An incident that can be controlled on site, but which may have an adverse effect on the public or the environment.</p>	
<ul style="list-style-type: none"> Danger of fire or explosion. Possible continuous release. Concentrated oil accumulating in close proximity to the site or vessel. Potential to impact other installations. 	<ul style="list-style-type: none"> Level 1 resources overwhelmed, requiring additional regional resources. Potential impact to sensitive areas and/or local communities. Local/national media attention/may adversely affect the public or the environment.
Level 3	
<p>An incident which has a wide-ranging impact on Santos and may require the mobilisation of external state, national or international resources to bring the situation under control.</p>	
<ul style="list-style-type: none"> Loss of well integrity. Actual or potentially serious threat to life, property, industry. Major spill beyond site vicinity. Significant shoreline environmental impact. 	<ul style="list-style-type: none"> Level 2 resources overwhelmed, requiring international assistance. Level 3 resources to be mobilised. Significant impact on local communities. International media attention.

4.2 Jurisdictional Authorities And Control Agencies

The responsibility for an oil spill is dependent on location and spill origin. The National Plan (AMSA 2020) sets out the divisions of responsibility for an oil spill response. Definitions of Control Agency and Jurisdictional Authority are as follows:

- Control Agency:** the organisation assigned by legislation, administrative arrangements or within the relevant contingency plan, to control response activities to a maritime environmental emergency. Control Agencies have the operational responsibility of response activities but may have arrangements in place with other parties to provide response assistance under their direction.
- Jurisdictional Authority:** the agency which has responsibility to verify that an adequate spill response plan is prepared and, in the event of an incident, that a satisfactory response is implemented. The Jurisdictional Authority is also responsible for initiating prosecutions and the recovery of clean-up costs on behalf of all participating agencies.

Table 4-2 provides guidance on the designated Control Agency and Jurisdictional Authority for Commonwealth and State waters and for vessel and petroleum activity spills. To aid in the determination of a vessel versus a petroleum activity spill, the following guidance is adopted:

- In Commonwealth waters, a vessel is a ship at sea to which the Navigation Act 2012 applies. Defined by Australian Government Coordination Arrangements for Maritime Environmental Emergencies (AMSA 2017a) as a seismic vessel, supply or support vessel, or offtake tanker.
- A petroleum activity includes facilities such as a fixed platform, FPSO/FSO, MODU, subsea infrastructure, or a construction, decommissioning and pipelaying vessel, as defined by Schedule 3, Part 1, Clause 4 and Volume 2, Part 6.8, Section 640 of the *OPGGGS Act 2006*.

Table 4-2: Jurisdictional and control agencies for hydrocarbon spills

Jurisdictional boundary	Spill source	Jurisdictional Authority	Control Agency		Relevant Documentation
			Level 1	Level 2/3	
Commonwealth waters (three to 200 nautical miles from territorial/state sea baseline)	Vessel ¹	AMSA	AMSA		Vessel SOPEP National Plan VGA-4H GI ST1 Well Decommissioning OPEP (this document)
	Petroleum activities ²	NOPSEMA	Titleholder		VGA-4H GI ST1 Well Decommissioning OPEP (this document)
Western Australian (WA) state waters (State waters to three nautical miles and some areas around offshore atolls and islands)	Vessel	WA Department of Transport and Major Infrastructure (DTMI)	WA DTMI	WA DTMI	Vessel SOPEP SHP-MEE (WA DoT 2024a) WA Incident Management Plan – Marine Oil Pollution (OSCP) (WA DoT, 2023) Van Gogh VGH-4H1 Well Decommissioning OPEP (this document)
	Petroleum activities	WA DTMI	Titleholder	WA DTMI	Van Gogh VGH-4H1 Well Decommissioning OPEP (this document) SHP-MEE (WA DoT 2024a)
WA State Waters within Pilbara Port Authority Limits ³	Vessel	WA DTMI	Port Authority ⁴	Port Authority / DTMI ⁵	Port of Varanus Island Port Handbook (Pilbara Port Authority 2021a) Pilbara Ports West – Marine Pollution Contingency Plan (Pilbara Port Authority 2021b) Port of Dampier Port Handbook (Pilbara Port Authority 2024) Port of Ashburton Port Handbook (Pilbara Port Authority 2022) SHP-MEE (WA DoT 2024a)
	Petroleum activities	WA DTMI	Port Authority	DTMI	SHP-MEE (WA DoT 2024a)

¹ Vessels are defined by Australian Government Coordination Arrangements for Maritime Environmental Emergencies (AMSA 2017) as a seismic vessel, supply or support vessel. Note: this definition does not apply to WA State waters.

² Includes a 'facility', such as a fixed platform, FPSO/FSO, MODU, subsea infrastructure, or a construction, decommissioning and pipelaying vessel. As defined by Schedule 3, Part 1, Clause 4 of the OPGGS Act 2006.

³ The Varanus Island port limits are defined in section 4 of the Port of Varanus Island Port Handbook (Pilbara Port Authority 2021a).

⁴ DTMI and the Port Authority may assign, through IMPs/OSCPs/OPEPs, emergency response functions to a Port Operator or Port Facility Operator for spills originating from their activities, however the role of Control Agency will remain with the nominated agency or organisation as per Table 4 2above (Pilbara Port Authority 2021a).

⁵ For any incident originating in Port Authority waters, the relevant Port Authority will be the Controlling Agency, unless for Level 2 and 3 incidents it is deemed by the HMA/SMPC in consultation with the Port Authority that it is more suitable for DTMI to be the Controlling Agency (WA DoT, 2024).

Jurisdictional boundary	Spill source	Jurisdictional Authority	Control Agency		Relevant Documentation
			Level 1	Level 2/3	
International Waters	All activities	Relevant foreign authority	Santos will liaise with the Australian Government Department of Foreign Affairs and Trade (DFAT) in the event that an oil spill may enter international waters. Santos will work with DFAT and the respective governments to support response operations.		

4.3 Petroleum Activity Spill In Commonwealth Waters

For an offshore petroleum activity spill in Commonwealth waters, the Jurisdictional Authority is the National Offshore Petroleum Safety and Environment Management Authority (NOPSEMA). NOPSEMA is responsible for the oversight of response actions to pollution events from offshore Petroleum Activities, in areas of Commonwealth jurisdiction. During a spill incident, NOPSEMA's role will be to implement regulatory processes to monitor and secure compliance with the *OPGGs Act 2006* and OPGGS(E)R, including the issuing of directions as required, and investigate accidents, occurrences and circumstances involving deficiencies in environment management.

Under the *OPGGs Act 2006* and OPGGS(E)R, the petroleum titleholder (i.e. Santos) is responsible for responding to an oil spill incident as the Control Agency in Commonwealth waters, in accordance with its OPEP.

4.4 Vessel Spills

AMSA manages the National Plan for Maritime Environmental Emergencies (AMSA, 2020) and is the Control Agency for all vessel-based spills in the Commonwealth jurisdiction. This includes vessels undertaking seismic surveys and associated supply or support vessels.

WA Department of Transport and Major Infrastructure (DTMI) manages the SHP – MEE (WA DoT 2024a) and is the Control Agency for all vessel-based spills in WA waters outside of a port proclaimed pursuant to the *Port Authorities Act 1999* (WA). For vessel-based spills within a port proclaimed pursuant to the *Port Authorities Act 1999* (WA), the relevant Port Authority or DTMI may be the Control Agency.

In all circumstances, the Vessel Master is responsible for implementing source control arrangements detailed in the vessel-specific SOPEP.

Once initial notifications to the Control Agency are made, Santos shall maintain direct contact with the Control Agency and act as a supporting agency throughout the response. This includes providing essential services, personnel, materials or advice in support of the Control Agency. In addition, Santos will be required to implement monitoring activities as outlined in the Monitor and Evaluate Plan (Section 10) and Operational and Scientific Monitoring (Section 17).

4.5 Cross-Jurisdictional Spills

4.5.1 Cross-Jurisdictional Petroleum Activity Spills

If a Level 2/3 petroleum activity spill crosses jurisdictions between Commonwealth and State waters, the Jurisdictional Authority remains true to the source of the spill (i.e. NOPSEMA for Commonwealth waters; and DTMI for State waters unless otherwise appointed through agreement between the Hazard Management Agency (HMA) / Jurisdictional Authority of both waters.

Where a Level 2/3 spill originating in Commonwealth waters moves into State waters, two Control Agencies will exist: DTMI and the petroleum titleholder (Santos), each with its own IMT and Lead IMT responsibilities. The arrangements between DTMI and Santos for sharing resources and coordinating a response across both Commonwealth and State waters are further detailed in Section 4.6.

4.5.2 Cross-Jurisdictional Vessel Spills

If a Level 2/3 vessel spill crosses jurisdictions between Commonwealth and State waters, two Jurisdictional Authorities will exist: AMSA for Commonwealth waters, and DTMI for WA State waters. The Control Agency will remain with the original nominated agency or organisation unless otherwise appointed through agreement between the HMA / Jurisdictional Authority of both waters. Santos will continue to provide all necessary resources (including personnel and equipment) as a supporting agency, as detailed in Section 4.6.

AMSA may request that DTMI manage a vessel incident in Australian Commonwealth waters (WA DoT 2024a).

4.6 Integration With Government Organisations

4.6.1 Australian Maritime Safe Authority

AMSA is the designated Control Agency for oil spills from vessels within Commonwealth jurisdiction. Upon notification to an incident involving a ship, AMSA will assume control of the incident and respond in accordance with the National Plan (AMSA 2020). AMSA is to be notified immediately of all ship-source incidents through the

AMSA Rescue Coordination Centre (RCC) Australia (refer to Santos Incident Response Telephone Directory [7700-670-PLA-0016.20]).

AMSA manages the National Plan, Australia's key maritime emergency contingency and response plan (AMSA 2020). AMSA fulfils its obligations under the National Plan for non-ship source pollution incidents on the formal request from the respective Offshore Petroleum Incident Controller/s (AMSA 2021a). AMSA also has a range of [National Plan supporting documents](#) containing related policies, guidance and advisory information.

For any oil pollution event, Santos will notify AMSA (as per Table 7-1) in the interests of facilitating the most efficient and effective response to the incident.

4.6.2 Western Australia – Department of Transport and Major Infrastructure

If a Marine Oil Pollution Incident enters State waters, the DTMI is the HMA (DTMI Chief Executive Officer or proxy). The Director Maritime Environmental Emergency (MEER) & Ports has been nominated by the HMA to perform the role of State Marine Pollution Coordinator (SMPC) (as prescribed in Section 1.3 of the SHP – MEE [WA DoT, 2024a]). Under the SHP-MEE, the Control Agency for Level 1 Petroleum Activity spills in State waters is the Petroleum Titleholder (Santos) with the Control Agency for Level 2/3 spills nominated as DTMI. During a MEE incident within State and Port waters, the role of the SMPC provides strategic management of the incident response on behalf of the HMA.

For Level 2/3 spills entering or within WA State waters/shorelines, DTMI as the Control Agency is the ultimate decision maker regarding identification and selection of protection priorities. DTMI will utilise their internal processes which typically includes the following:

- evaluation of situational awareness information, including all surveillance, monitoring and visualisation data provided by the Titleholder
- evaluation of resources at risk including use of the WA Oil Spill Response Atlas and any other relevant WA/Commonwealth government databases or other information sources
- evaluation of shoreline types, habitat types and seasonality of environmental, socio-economic and cultural values and sensitivities
- consultation with the State Environmental Scientific Coordinator and other relevant State and Federal government departments with environmental responsibilities
- consultation with other relevant oil spill agencies, including the AMSA Environment, Science and Technology network or any other experts as necessary
- activation of State resources to support culture and heritage management (via request to the SMPC) sourced through State arrangements pertaining to Local Emergency Management Committees, Native Title Management, Heritage Management, and incorporation of local knowledge (WA DoT, 2024)
- all information is utilised in a NEBA/ Spill Impact Mitigation Assessment (SIMA) type process, to determine protection priorities and response strategies.

DTMI will adjust/amend their internal processes to suit the spill situation at the time.

Santos will notify the DTMI Maritime Environmental Emergency Response (MEER) unit as soon as reasonably practicable (within 2 hours of spill occurring) if an actual or impending spill occurs within or may impact WA State waters. On notification, the SMPC will activate their MEECC and the DTMI IMT.

For facility oil spills entering State waters (i.e. across jurisdictions) DTMI will only assume the role of Control Agency for that portion of the response activity that occurs within State waters, and therefore both Santos and DTMI will be Control Agencies. Titleholders will work in partnership with DTMI during such instances, as outlined within the [DTMI's Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements](#) (WA DoT 2020). Santos will conduct initial response actions in State waters as necessary in accordance with its OPEP and continue to manage those operations until formal handover of incident control in State Waters is completed. Appendix 1 in DTMI's Offshore Petroleum Industry Guidance Note (WA DTMI 2020) provides a checklist for formal handover. Beyond formal handover, Santos will continue to provide all necessary resources, including personnel and equipment, to assist the DTMI in performing duties as the Control Agency for State Waters.

For a cross-jurisdictional response, there will be a Lead IMT (DTMI or Santos) for each spill response activity, noting that DTMI only has jurisdictional/control agency authority within State waters.

Appendix 2 in DTMI's [Offshore Petroleum Industry Guidance Note](#) (WA DoT 2020) provides guidance on the allocation of a Lead IMT to response activities for a cross-jurisdictional spill.

To facilitate coordination between DTMI and Santos during a cross-jurisdictional response, a Joint Strategic Coordination Committee will be established. The Joint Strategic Coordination Committee will be jointly chaired

between the SMPC and a nominated senior representative of Santos and will ensure alignment of objectives and provide a mechanism for de-conflicting priorities and resourcing requests.

For a cross-jurisdictional response Santos will be responsible for ensuring adequate resources are provided to DTMI as Control Agency, initially 11 personnel to fill roles in the DTMI IMT or Forward Operating Bases (FOB) (refer to Section 5.2) and operational personnel to assist with those response strategies where DTMI is the Lead IMT. Concurrently DTMI will also provide two of their personnel to the Santos IMT as described in Table 5-2. Santos' CMT Liaison Officer and the Deputy Incident Controller are to attend the DTMI Fremantle Incident Control Centre (ICC) as soon as possible after the formal request has been made by the SMPC. It is an expectation that the remaining initial cohort will attend the DTMI Fremantle ICC no later than 8am on the day following the request being formally made to Santos by the SMPC. Santos personnel designated to serve in DTMI's FOB will arrive no later than 24 hours after receipt of formal request from the SMPC.

Figure 4-1 shows the organisational structure of Santos incident management personnel within Santos IMT and embedded within DTMI's MEECC/ IMT. Figure 4-2 shows the overall cross-jurisdictional organisational structure referenced from the SHP-MEE.

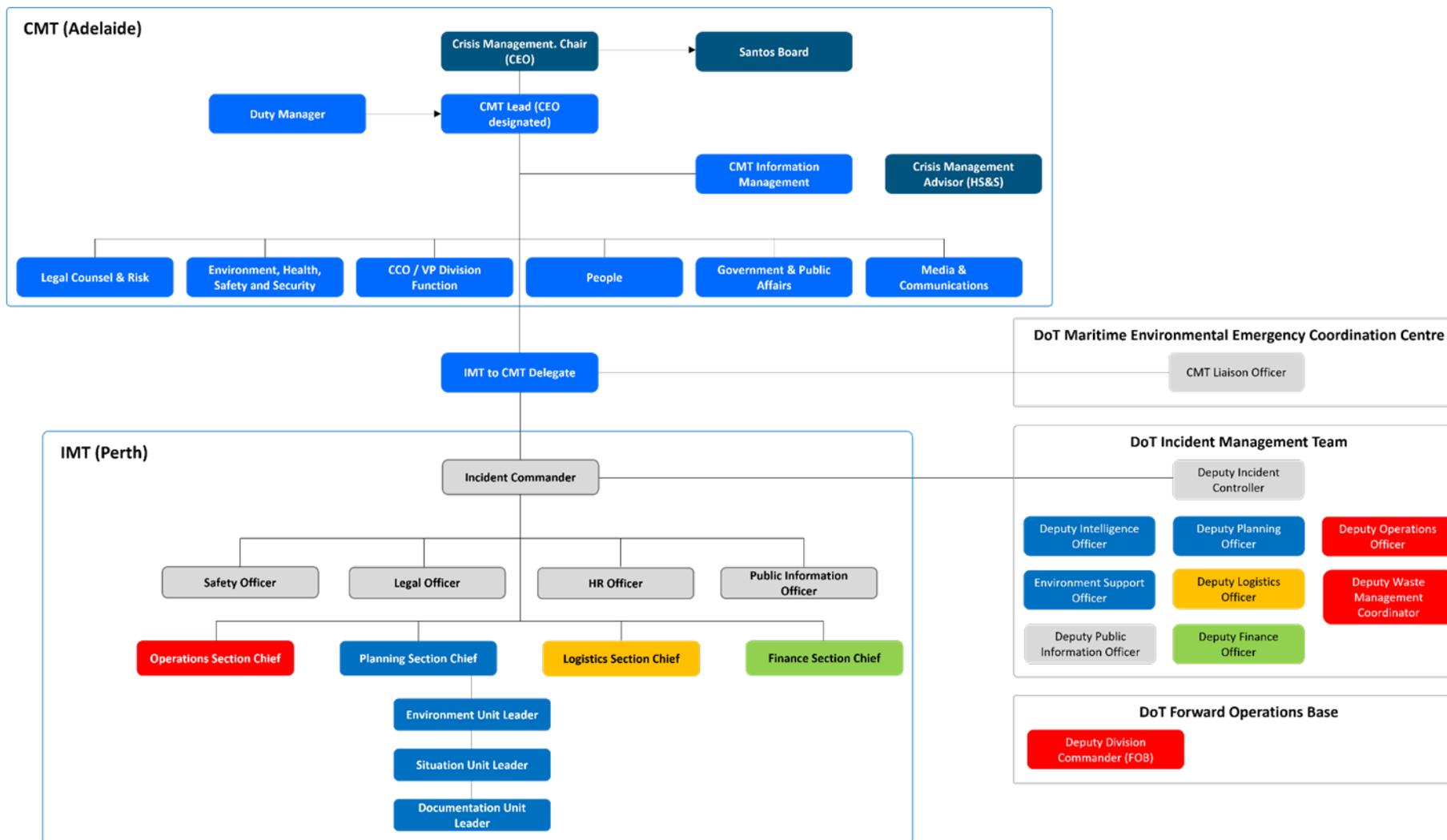


Figure 4-1: Santos cross-jurisdictional incident management structure for a Level 2/3 facility oil pollution incident originating within or entering WA State waters

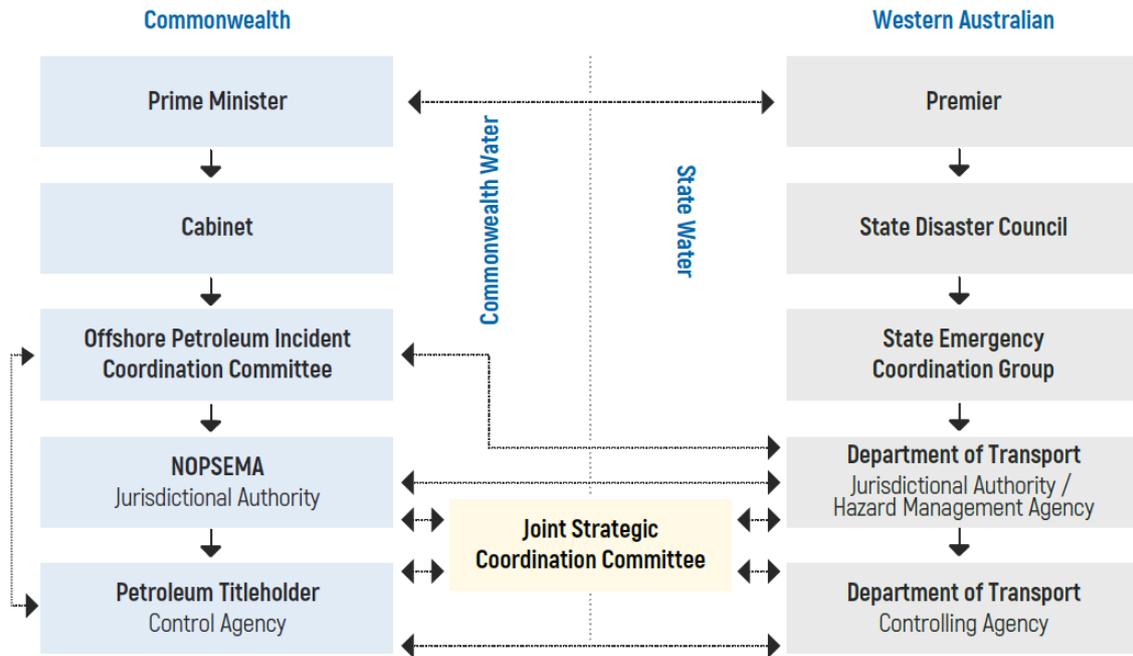


Figure 4-2: Overall control and coordination structure for offshore petroleum cross-jurisdiction incident

4.6.2.1 Consent for use of Dispersant in State Waters and Notification of use in Adjacent Commonwealth Waters

Approval for the use of dispersant in State waters during an incident shall be pursuant to the [DTMI Dispersant Use Consent Framework](#). Administered by DTMI, the process will include input from the Environmental Scientific Coordinator (ESC) and require written consent from the HMA/SMPC prior to any dispersant being applied to State waters (WA DoT 2024b).

The use of dispersant in Commonwealth waters does not require the consent of DTMI. However, where the use of dispersant in Commonwealth waters may impact State waters, the DTMI requests to be consulted prior to any dispersant application (WA DoT, 2024b). This will enable potential cross-jurisdictional impacts to be considered appropriately in the operational NEBA with the relevant jurisdictional authority.

NOPSEMA’s assessment of the EP and OPEP prior to a petroleum activity commencing provides the mechanism for acceptance of dispersant use and deployment strategies in Commonwealth waters, prior to a MOP incident occurring. Any dispersant use in response to a MOP incident from a Commonwealth offshore petroleum activity must be carried out in accordance with an accepted EP (WA DoT, 2024b).

Limitations on surface dispersant application are described further in Section 13.1.1.

4.6.3 Western Australian Department of Biodiversity, Conservation and Attractions

The Western Australian Department of Biodiversity, Conservation and Attractions (DBCA) has responsibilities associated with wildlife and activities in national parks, reserves and State marine parks. The Biodiversity Conservation Act 2016 (WA) is the legislation that provides DBCA with the responsibility and Statutory Authority to treat, protect, and destroy wildlife. In State waters, DBCA is the Jurisdictional Authority for Oiled Wildlife Response (OWR), providing advice to the Control Agency (DTMI). The role of DBCA in an OWR is outlined in the Western Australian Oiled Wildlife Response Plan (WAOWRP) (DBCA 2022a).

For a Level 2/3 petroleum spill that moves into State waters, DTMI will be the Control Agency responsible for overall command of an oiled wildlife response. Santos will provide all necessary resources (equipment and personnel primarily through AMOSC membership) to DTMI to facilitate this response.

Any deterrence, displacement or rescue activity involving wildlife in WA (living or dead) constitutes “disturbance” or “taking” of wildlife under the Biodiversity Conservation Act 2016 and will require authorisation through DBCA unless undertaken by licensed personnel. The DBCA OWA will expedite the process of granting interim licences or other authorities to undertake approved activities. No action specifically targeted at wildlife should occur without this authority. Deceased animals disposal will be managed in accordance with the DBCA’s WAOWRP which describes the process for disposal of dead animals/carcasses. Initially, the granting of authority to take deceased wildlife is likely to be via a direction from a DBCA wildlife officer while the appropriate licences or licence holder/s that the animals can be held by are identified and organised.

For matters relating to environmental sensitivities and scientific advice in State waters DBCA may provide an Environmental Scientific Coordinator (ESC) to support the SMPC and/or DTMI Incident Controller.

This may include advice on priorities for environmental protection, appropriateness of proposed response strategies and the planning and coordination of operational monitoring for response effectiveness evaluation and planning scientific monitoring for impact and recovery assessment. The ESC can also advise on where AMSA National Plan Dispersant Effectiveness Test Kits can be located, which could be utilised in addition to Santos dispersant testing resources (refer to Section 13).

4.6.4 Department of Foreign Affairs and Trade

In the event of a spill predicted to migrate into neighbouring countries Exclusive Economic Zones, Santos will notify the Department of Foreign Affairs and Trade (DFAT) who will in turn notify the affected government(s) and engage the preferred methods for Santos to respond in order to minimise the impacts to ALARP. In most cases, NOPSEMA, Department of Industry, Science and Resources (DISR) and DFAT will form an inter-agency panel; the Australian Government Control Crisis Centre, who may request AMSA to coordinate the response operations across the trans-national boundary. Santos remains willing to respond as per the direction of the affected government(s) and designated Control Agency, following approvals established between DFAT and the affected countries government.

4.6.5 Department of Industry, Science and Resources

The Department of Industry, Science and Resources (DISR) will be the lead Commonwealth Agency for the provision of strategic oversight and Commonwealth government support to a “Significant” offshore petroleum incident (including oil spill incidents). DISR will be notified by NOPSEMA of a significant oil pollution incident and under the Offshore Petroleum Incident Coordination Framework will stand up the Offshore Petroleum Coordination Committee as the mechanism to provide Commonwealth strategic advice and support to the incident. To facilitate information between the petroleum titleholder IMT and Offshore Petroleum Incident Coordination Committee, Liaison Officer/s will be deployed from DISR to the petroleum titleholder IMT.

For incidents that are classified at a greater level than “Significant” (i.e. crisis level), a whole of government crisis committee will be formed under the Australian Government Crisis Management Framework to provide strategic advice and support and the Offshore Petroleum Incident Coordination Committee will not be convened, although DISR will remain as the lead agency.

4.7 Interface with External Organisations

Santos has contracts in place enabling access to Oil Spill Response Organisations (OSROs). OSROs have put specific measures in place to ensure that they are able to continue to meet their commitments to members. This support can be provided directly or remotely to aid the IMT and/or ERT.

4.7.1 Australian Marine Oil Spill Centre

Santos is a Participating Member of AMOSC and as such has access to AMOSC’s equipment and personnel as outlined in the [AMOSPlan](#) (AMOSC 2021).

AMOSC has contracts with all its member companies to enable the release of Core Group personnel to be made available for spill response, as outlined in Santos’ Master Service Contract and Principle and Agency Agreement with AMOSC.

The mutual aid arrangements that AMOSC operates under are collaborated under the AMOSPlan and are activated via the AMOSC Duty Officer. This provides the mechanism for members of AMOSC to access oil spill response capability of other members. To further enhance the mutual aid arrangements, Santos, Chevron, Woodside and Jadestone have signed a memorandum of understanding (MoU) that defines the group’s mutual aid arrangements. Under this MoU, Santos, Chevron, Woodside and Jadestone have agreed to use their reasonable endeavours to assist in the provision of emergency response services, personnel, consumables and equipment.

4.7.2 Oil Spill Response Limited

Through an associate membership, Santos has access to spill response services from OSRL with offices in Perth, Singapore, UK and at other various locations around the globe. In the event of a Level 2/3 response, Santos could access OSRL’s international personnel, equipment and dispersants to supplement resources available within Australia. Santos may also call on OSRL for technical services to support its IMT.

Under the OSRL Associate membership Service Level Agreement (SLA), Santos has access to response personnel (18 personnel per incident) and 50% of the global response equipment stockpile. In addition to this,

Santos is also a member of OSRL's Global Dispersant Stockpile (GDS) and Operational and Scientific Monitoring (OSM) Services Supplementary Agreement.

The GDS Supplementary Agreement provides Santos with access to 5,000 m³ of dispersant stockpile in addition to the dispersant stockpile available under the Associate membership SLA. The OSM Services Supplementary Agreement provides Santos with access to Operational and Scientific monitoring services. Additional information on OSM services and capability is provided in the Santos North West Shelf OSM-BIP (7715-650-ERP-0002).

Santos also has access to additional dispersant stockpiles held by OSRL through a Global Dispersant Stockpile Supplementary Agreement.

4.7.3 Wild Well Control Inc.

Santos maintains a contract with Wild Well Control Inc. (WWCI) for well control specialist services including relief well drilling and capping stack deployment. WWCI maintains well control response teams on standby at all times to ensure a rapid response to a well control event anywhere in the world. WWCI maintains an inventory of well control, firefighting, and special services equipment at its Houston headquarters and at other locations in the US and internationally.

4.7.4 The Response Group

The Response Group (TRG) is an international provider of crisis management and emergency response services including oil spill response. TRG are available to Santos 24/7 and can provide personnel for emergency response support.

4.7.5 Pilbara Ports Authority

Pilbara Ports Authority has established an overarching Marine Pollution Contingency Plan (MPCP) for Pilbara Ports (Pilbara Ports Authority 2021a), which covers all Pilbara Ports West waters. The MPCP is a source of information for those individuals and agencies that are responsible for developing and managing oil spill response capabilities within Pilbara Ports West port limits, which includes the Port of Varanus Island and Port of Dampier.

In 2023 WA DTMI developed a guidance note for WA ports on response and collaboration arrangements during maritime environmental emergencies including oil spills that impact port waters. This [Guidance Note](#) outlines the roles and responsibilities of the Department of Transport and Major Infrastructure (DTMI), and Port Authorities or Port Operators under those arrangements and seeks to promote consistency between Port Authority and Port Operator provisions for the management of Marine Oil Pollution (MOP) or Marine Transport Emergency (MTE) incidents within Port waters, and the overarching arrangements for WA as outlined in the State Hazard Plan – Maritime Environmental Emergencies (SHP-MEE) (WA DoT 2024a), the National Plan for Maritime Environmental Emergencies (National Plan), and the State Emergency Management Framework.

Port of Dampier / Port of Ashburton

Any marine oil pollution incident (irrespective of quantity) within either the Port of Dampier or Port of Ashburton port limits should be verbally reported immediately to Dampier or Ashburton vessel traffic services (VTS) via VHF or telephone. A POLREP is also to be submitted to WA DTMI (Pilbara Port Authority 2022; 2024). A call to The Emergency Tower mobile should also be made. Pollution reporting requirements are provided in Appendix C.

Port of Varanus Island

The Port of Varanus Island (VI) transitioned to Pilbara Ports Authority on 1 July 2021. The VI Port limits are defined in Section 4 of the Port of VI Handbook. Santos is the port operator of the Port of VI and provides the necessary services required to conduct safe operation of the facilities under Santos control. The Port of VI is governed by Pilbara Ports Authority under the WA Port Authorities Act 1999 (Pilbara Port Authority 2021).

Any marine oil pollution incident (irrespective of quantity) that has a risk of traversing within the Port limits should be verbally reported within 4 hours to the Harbour Master via VI Port Control. A follow up report must be made within 48 hours through the Pilbara Ports Authority Hazard and Incident Reporting Form (refer to Table 7-1). Pilbara Ports Authority also expects a POLREP to be submitted to WA DTMI (refer to Appendix C) (Pilbara Port Authority 2021).

4.7.6 Barrow Island Port Authority

The Barrow Island Port Harbour Master should be notified if there is a risk of a spill from an external source entering the port limits. In the first instance, verbal notification may be given; however, this should be followed up by submitting a to the Harbour Master, and to DTMI, as soon as practicable (Chevron Australia, 2023).

4.8 Resourcing Requirements

The oil spill response resourcing requirements have been considered within this OPEP for each response strategy. To fulfill the required roles, resources have been selected from the various available OSROs and pools of specialist personnel available to Santos within the industry, based on the worst-case response needs which have been identified from the oil spill modelling results.

The resourcing requirements have focused on specialist roles requiring a minimum level of training and competence (i.e. supervisors/ team leaders). Other personnel required to execute a response have been considered, and are based on resourcing from general labour hire, with some requiring a minimum level of induction type training.

The resourcing requirements have been considered on a cumulative basis to ensure adequate availability of specialist response personnel, if all response strategies identified in this OPEP are required simultaneously (refer to Appendix Q).

5. Santos Incident Management Arrangements

5.1 Incident Management Structure

The Santos IMT (Perth) and Crisis Management Team (CMT) will be activated in the event of a Level 2/3 hydrocarbon spill⁶ regardless of the type of spill or jurisdiction. Santos maintains internal resources (trained personnel and equipment) across its activities that provide first strike response capability and to also support an ongoing response. Should an incident occur, the IMT Duty Manager would be notified immediately. This rostered role is on-call, filled by trained Incident Commanders and available 24 hours/day and 7 days/week. The IMT Duty Manager would then activate the IMT via an automated call-out system. Documentation required in a response is accessed via the Santos Emergency Response (ER) intranet site.

As outlined in Section 4, control of the response may be taken over by the relevant Control Agency as the incident progresses. The Santos response structure to a major emergency incident is detailed in the Santos Incident Management Plan – WANATL (7700-670-PLA-0016) and the Santos Incident Management Handbook. The Incident Management Plan – Upstream Offshore and Santos Incident Management Handbook describe response planning and incident management that would operate under emergency conditions – describing how the Santos IMT operates and interfaces with the CMT and external parties.

The first priority of an escalating oil spill response to a Level 2/3 spill is forming an IMT and establishing an incident coordination centre (ICC)⁷. The ongoing involvement of the IMT and CMT will depend on the severity and type of spill and the obligations of Santos and other agencies/authorities in the coordinated spill response.

Santos' incident response structure relevant to a VGA-4H GI ST1 Well Suspension / Decommissioning incident includes:

- Facility based ERT
- Santos IMT-Perth based ICC to coordinate and execute responses to an oil spill incident
- Santos CMT- to coordinate and manage threats to the company's reputation and to handle Santos' corporate requirements in conjunction with the Perth-based Santos IMT to CMT Delegate
- Other field-based command, response and monitoring teams for implementing strategies outlined in the OPEP.

The Santos emergency response organisational structure is defined in the Incident Management Plan – WANATL and Santos Incident Management Handbook (see also Figure 5-1). The Santos IMT roles and field-based teams are scalable; roles can be activated and mobilised according to the nature and scale of the emergency response.

If the incident involves a loss of well control (LOWC), the Santos Source Control Branch would also be included in the incident response structure. This team would comprise the following sub-teams, according to the applicable source control strategies:

- Relief Well Team
- Well Intervention Team.

The Santos Source Control branch (Figure 5-1) reports directly to the Operations Section Chief and is responsible for :

- coordinating engineering safety and operational activities
- managing source control technical personnel from third parties (e.g. Wild Well Control Inc)
- developing task-specific plans and procedures
- identifying and sourcing required tools and equipment
- approving source control components of IAPs.

⁶ Note that Santos may also choose to activate the IMT regardless of the spill response Levels.

⁷ The Santos ICC is located in the Santos WA Perth Office

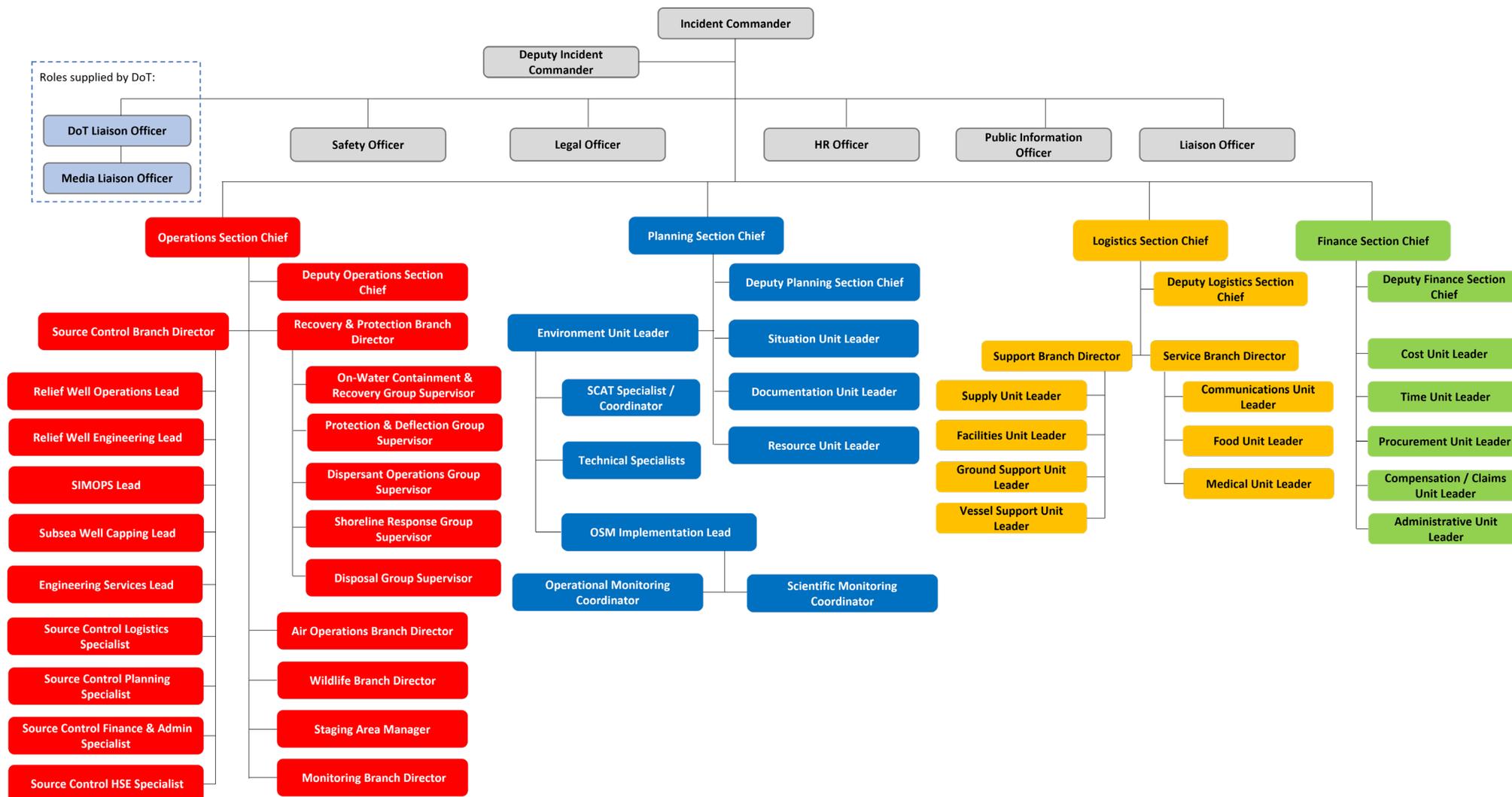


Figure 5-1: Santos incident management team organisational structure

Note: For a Level 2/3 petroleum activity spill whereby DTMI is the Control Agency, either within a single jurisdiction (State water only spills) or cross-jurisdictional (spills from Commonwealth to State waters), Santos will work in coordination with DTMI in providing spill response capability. In these cases Santos may be required to supply the DTMI IMT Support roles to the DTMI MEECC / DTMI IMT. This is detailed further in Section 4.6.2 and Figure 4-1.

Note: For this activity, the role of 'Subsea Well Capping Lead' is not applicable.

5.2 Roles and Responsibilities

The following tables provide an overview of the responsibilities of the:

- Santos CMT (Table 5-1);
- Santos IMT (Table 5-2);
- Field-based response team members (Table 5-3);
- DTMI roles embedded within Santos CMT/IMT (Table 5-4); and
- Santos roles embedded within the WA State MEECC/DTMI IMT and FOBs (Table 5-5).

Not all of the roles listed in Table 5-2 are shown in Figure 5-1, as some of the roles in Table 5-2 are support roles or are specific to a particular response strategy. Figure 5-1 shows the full IMT structure, however some of the roles may not be applicable for a particular activity. Full responsibilities and checklists/job cards of each role are described in the Santos Incident Management Plan – WANATL (7700-670-PLA-0016), Santos Incident Management Handbook and Santos Crisis Management Plan (SMS-HSS-OS05-PD03) to support the incident action planning process. The IMT and field-based teams are scalable to the nature and scale of the response.

As per Dot’s [Offshore Petroleum Industry Guidance Note – Marine Oil pollution: Response and Consultation Arrangements](#), where DTMI is the Control Agency for spill response, Santos will provide personnel to work within DTMI’s organisational structure (Table 5-5). DTMI will also provide a Liaison Officer / Duty Incident Commander to the Santos IMT in a coordinated response.

Table 5-1: Roles and responsibilities in the Santos Crisis Management Team

Santos CMT Role	Main Responsibilities
Crisis Management Chair (CEO)	<p>The Crisis Management (CM) Chair (Santos CEO) is responsible for:</p> <ul style="list-style-type: none"> • Leading crisis management direction. • Providing governance and oversight of CMT operations. • Providing enterprise and strategic direction to the CMT for resolving the crisis event. • Delegating the CM Lead role and accountability to the appropriate ExCom designee. • Engaging with the CM Lead to endorse the crisis resolution plan. • Liaising with the Santos Board and strategic stakeholders. • Providing the full extent of the company’s resources to bring about a resolution and recovery from the crisis impact.
CMT Lead/Duty Manager	<p>The CMT Lead is responsible for:</p> <ul style="list-style-type: none"> • Determining the need for establishing a Level 3 response and for activating the CMT. • Determining which, if any, Crisis Management Support Teams (CMST) are mobilised. • Leading the crisis resolution process • Ensuring internal and external notifications are sent to key stakeholders. • Using the crisis resolution process to determine enterprise level impacts (potential or actual) and strategic objectives. • Ensuring a crisis resolution plan is developed and directing the CMT functions to implement strategies, action plans and tasks. • Determining when it is appropriate to conclude the crisis response and stand down all or a portion of the CMT.
CMT Information Management	<p>The CMT Information Managers directly support the CMT by:</p> <ul style="list-style-type: none"> • Supporting the CMT during crisis management operations. • Setting up the crisis management room, assist with set-up of communications, video conferences and information transfer within the CMT. • Advising on CMT operating processes and available resources. • Assisting with reserving break out rooms for the CMT functions and CMSTs. • Ensuring CMT crisis resolution forms are used and displayed on the monitors. • Providing IAP information when an IMT is established. • Monitoring and managing the welfare needs of the CMT.
Crisis Management Advisor	<p>The Crisis Management Advisor is responsible for:</p> <ul style="list-style-type: none"> • Providing CMT process guidance and advice to CMT Lead, Function Leaders, and CMST.

Santos CMT Role	Main Responsibilities
	<ul style="list-style-type: none"> Supporting and facilitating the crisis resolution planning process. Liaising between the CMT and IMT. Working with CMT Information Managers to manage rosters and handovers for extended CMT operations. Scheduling and facilitating post crisis debriefs and after-action reviews. <p>The Crisis Management Advisor will support the CMT Lead by:</p> <ul style="list-style-type: none"> Facilitating CMT activation requirements with the CMT Lead. Assisting the CMT Lead in maintaining an ongoing assessment of incident potential and analysis of stakeholder impacts. Advising the CMT Lead on CMT structure and requirements for CMST engagement. Coordinating tasks delegated by CMT Lead. Providing tools to the CMT Lead for review and crisis assessment meetings.
CMT Function Leads	<p>CMT Function Leads include leaders for these areas:</p> <ul style="list-style-type: none"> Legal Counsel and Risk. Environment, Health, Safety and Security. Operating Unit VP. People. Government and Public Affairs (GAPA). Media and Communications. <p>The CMT Function Leads are responsible for:</p> <ul style="list-style-type: none"> Participating in and contributing to the crisis resolution planning process. Determining critical communications pertaining to their area. Mobilising and coordinating activities of the function's CMST. Advising the CMT Lead on strategic impacts, threats and mitigation created by the crisis event. Developing and implementing strategies to meet objectives endorsed by the CM Chair. Providing support and resources via the CMST to divisional IMTs. Ensuring critical actions, decisions or points of strategic criticality are included in the CMT log. Participating in the crisis management debriefings and after-action reviews.

Table 5-2: Roles and responsibilities in the Santos Incident Management Team⁸

Santos Management /IMT Role	Main Responsibilities
IMT to CMT Delegate	<ul style="list-style-type: none"> Depending on the level of the incident, the IMT to CMT Delegate (and/or their delegate) will act as the primary liaison to the CMT Duty Manager. On the activation of the IMT, the IMT to CMT Delegate is advised by the IMT Duty Manager.
Incident Commander (and Deputy Incident Commander)	<ul style="list-style-type: none"> Overall management of the incident. Sets response objectives and strategic directions. Oversees the development and implementation of Incident Action Plans.
Safety Officer	<ul style="list-style-type: none"> Develops and recommends measures for assuring personnel safety Assesses and/or anticipates hazardous and unsafe situations. May have specialists as necessary.
Legal Officer	<ul style="list-style-type: none"> Responsible for identifying potential legal issues stemming from the incident and providing advice and direction on all matters of a legal nature.
Human Resources (HR) Officer	<ul style="list-style-type: none"> Advises and assists the Incident Commander, Command Staff and Section Chiefs on any HR related aspects of an incident.

⁸ These roles are aligned with the Santos Incident Management Handbook

Santos Management /IMT Role	Main Responsibilities
Public Information Officer	<ul style="list-style-type: none"> Develops and releases information about the incident to media, incident personnel and to appropriate agencies and organisations.
Liaison Officer	<ul style="list-style-type: none"> Acts as the conduit for assisting and cooperating with agency or organization representatives, particularly for incidents that are multi-jurisdictional or have several agencies involved.
Operations Section Chief*	<ul style="list-style-type: none"> Leads the Operations Section within the IMT. Manages all tactical operations directly applicable to the primary assignments. Activates and supervises operational elements in accordance with the IAP and directs its execution.
Deputy Operations Section Chief	<ul style="list-style-type: none"> Flexible role. May support the Operations Section Chief in a relief capacity, or by supervising field operations in lieu of an On-Scene Commander.
Source Control Branch Director	<ul style="list-style-type: none"> The Source Control Branch Director will be responsible for the implementation of the Source Control Plan (as per the Source Control Planning and Response Guideline – DR-00-OZ-20001) and will activate and supervise source control elements in accordance with the Incident Action Plan and direct their execution.
Relief Well Operations Lead	<ul style="list-style-type: none"> Responsible for all operational aspects related to the drilling of a relief well and the subsequent dynamic kill operation through to abandonment of both the relief and incident well(s). Works closely with the Relief Well Engineering Sector and Logistics Section to source the MODU, dynamic kill pumping equipment and operational personnel.
Relief Well Engineering Lead	<ul style="list-style-type: none"> Responsible for the planning, permitting and execution of a relief well. Works closely with the Relief Well Operations Sector and Logistics Section to source relief well tangibles.
SIMOPS Lead	<ul style="list-style-type: none"> Co-ordinates all activities within the 1,000 metre (or less) radius of the incident well. Responsible for the co-ordination of resources and activities to ensure their safe and efficient utilisation in a prioritised way. The SIMOPS group co-ordinates vessel and aviation activities within the 1,000 metre zone and interfaces closely with other surface responders.
Engineering Services Lead	<ul style="list-style-type: none"> Responsible for performing an array of engineering activities that support adjacent groups response efforts. Focused on developing models and engineering outputs that would be used by various operations teams throughout the response organisation.
Recovery & Protection Branch Director	<ul style="list-style-type: none"> Responsible for overseeing and implementing the protection, containment and clean-up activities established in the IAP. Depending on the size and nature of the incident, will direct various groups led by the following Group Supervisors: <ul style="list-style-type: none"> On-Water Containment & Recovery Group Supervisor: Responsible for the deployment of on water containment and recovery operations in the designated locations in compliance with the IAP. Protection & Deflection Group Supervisor: Responsible for diversion/protection booming in the designated locations in compliance with the IAP. Dispersant Operations Group Supervisor: Responsible for coordinating all aspects of dispersant operations in compliance with the IAP. For aerial applications, the Group works closely with the Air Operations Branch. Shoreline Response Group Supervisor: Responsible for leading all shoreline response activities working closely with the shoreline clean-up supervisors at various locations. The Disposal Group Supervisor is responsible for coordinating the on-site activities of personnel engaged in collecting, storing, transporting and disposing of waste materials, in compliance with the IAP
Air Operations Branch Director	<ul style="list-style-type: none"> Responsible for the coordination of the air operations section (ICS 220) of the IAP and for providing logistical support to incident aircraft.
Wildlife Branch Director	<ul style="list-style-type: none"> Working with relevant state authorities, responsible for implementing the OWR plan for the incident including the deployment of equipment and personnel required.
Staging Area Manager	<ul style="list-style-type: none"> Responsible for supervising the Staging Area Managers as well as coordinating their activities including assigning Staging Area Managers, receiving, maintaining, checking in/out, storing and distributing resources.
Monitoring Branch Director	<ul style="list-style-type: none"> Working closely with the Environment Unit, responsible for implementing the operational and scientific monitoring plans required based on the nature and scale of the incident.

Santos Management /IMT Role	Main Responsibilities
Planning Section Chief* (and Deputy Planning Section Chief)	<ul style="list-style-type: none"> Leads the Planning Section within the IMT. Collects, evaluates, disseminates and uses incident information. Maintains status of assigned resources.
Environment Unit Leader	<ul style="list-style-type: none"> Responsible for environmental matters associated with the response, including strategic assessment, modelling, surveillance and environmental monitoring and permitting.
Situation Unit Leader	<ul style="list-style-type: none"> Responsible for collecting, processing, and organizing incident information relating to escalation, mitigation or intelligence activities taking place in an incident. Responsible for preparing future projections of incident growth, maps, and intelligence information.
Documentation Unit Leader	<ul style="list-style-type: none"> Responsible for maintenance of accurate, up-to-date incident files including Incident Action Plans. Incident reports, communication logs, situation status reports etc.
Resource Unit Leader	<ul style="list-style-type: none"> Responsible for maintaining the status of all assigned tactical resources and personnel at an incident. Oversees the check-in of all tactical resources and personnel, maintaining a status-keeping system indicating current location and status of all the resources.
SCAT Specialist/ Coordinator	<ul style="list-style-type: none"> Primary point of contact within the IMT for all SCAT activities Acts as project manager for SCAT program and will design and direct the SCAT program for any incidents Implements and manages the day-to-day activities for the SCAT program including establishing good management practices and safety protocols for the field teams, chairing SCAT Field Survey Team briefings and debriefings and producing daily and weekly summaries of field reports.
Technical Specialists	<ul style="list-style-type: none"> The Environment Unit Lead may be supported by various technical specialists according to the specific details and circumstances of the oil spill incident.
OSM Implementation Lead	<ul style="list-style-type: none"> Identifies the relevant OMP and SMP components that may be triggered based on the information collected during the initial response and OMP monitoring. Ensures that the relevant OMP and SMPs are implemented at the appropriate times. Confirms monitoring priorities with the Environment Unit Lead EUL and continually re-evaluate. Integrates any protected matters requirements into final monitoring designs. Approves monitoring designs and monitoring plans. Liaises with relevant stakeholders and regulators on monitoring design, monitoring priorities, and results.
Operational Monitoring Coordinator	<ul style="list-style-type: none"> Assists the OSM Implementation Lead in finalising the monitoring design for individual OMPs (Operational Monitoring Coordinator) / SMPs (Scientific Monitoring Coordinator). Understands the data metrics collected in the event of a spill. Advises the OSM Implementation Lead on data collection, logistical support required, and monitoring priorities if constraints (e.g. safety, time, logistics) are encountered.
Scientific Monitoring Coordinator	<ul style="list-style-type: none"> Oversees data analyses and interpretation. Manages data, including spatial data. Presents data in an appropriate and informative format to allow for timely decisions.
Logistics Section Chief* (and Deputy Logistics Section Chief)	<ul style="list-style-type: none"> Responsible for providing facilities, services and materials in support of the incident. Participates in the development and implementation of the Logistics Section of the IAP.
Support Branch Director	<ul style="list-style-type: none"> Responsible for the development and implementation of logistics plan in support of the IAP. The Support Branch supervises the operations of the Supply, Facilities, Ground Support and Vessel Support Units.
Service Branch Director	<ul style="list-style-type: none"> Responsible for the management of all service activities for the incident including the operations of the Communications, Medical and Food Units
Finance Section Chief* (and Deputy Finance Section Chief)	<ul style="list-style-type: none"> Responsible for all the financial, administrative and cost analysis aspects of the incident and for supervising members of the Finance Section

Santos Management /IMT Role	Main Responsibilities
Cost Unit Leader	<ul style="list-style-type: none"> Responsible for collecting all cost data and providing cost estimated and any cost saving recommendations for the incident
Time Unit Leader	<ul style="list-style-type: none"> Responsible for equipment and personnel time recording to include personnel travel, work hours, transfers, promotions. Liaise with each response organisation management and ensure daily personnel time records are prepared and in compliance with Santos policies.
Procurement Unit Leader	<ul style="list-style-type: none"> Responsible for administering all financial matters pertaining to vendor contracts and leases. Executes all procurements in accordance with the Santos policies and procedures
Compensation / Claims Unit Leader	<ul style="list-style-type: none"> Responsible for the management and direction of all administrative matters pertaining to compensation and claims related matters for any incident

* Note: The Section Chiefs are supported by various other roles that will be mobilised depending on the severity of the incident.

Table 5-3: Roles and responsibilities in the field-based response team (ERT)

Field-based position	Main responsibilities
Emergency Commander⁹	<ul style="list-style-type: none"> Assesses facility-based oil spill situations / incidents and respond accordingly. Single point of communications between facility/site and IMT. Directs emergency response activities in accordance with the Santos emergency response principles and philosophy. Develops an emergency response strategy. Communicates the emergency response actions and delegates actions to the Incident Commander in the IMT. Manages the spill incident in accordance with the Facility Emergency Response Plan, Third Party Incident Response Plan and/or the activity-specific OPEP (this document). Coordinates medical evacuations as required. Liaises with the Perth IMT Operations Section Chief if/when the IMT is established.
Emergency Coordinator	<ul style="list-style-type: none"> Establishes and maintains contact with the incident scene. Ensures information is passed to and from the On-Scene Commander, including relevant emergency information from the Command team time-outs. Such information may include the source of the spill, whether the spill is ongoing or contained, and no. of personnel responding. Also advise On-Scene Commander when next Command Team time-out will be. Ensures accurate transfer of information from On-Scene Commander to Status Board log person. Communicates with outside assistance, e.g. vessels, aircraft, etc. If instructed, coordinates activities such as spill control/response strategies. If instructed, liaises with onshore technical authorities & onshore IMT. Informs Emergency Commander of incident and vessel status.
On-Scene Commander (OSC) (ERT Field Team Leader)	<ul style="list-style-type: none"> Undertakes command and leads field response as directed by the Emergency Coordinator, where safe to do so. Establishes, when appropriate, a Forward Control Point. Maintains spill responder safety in accordance with the Santos response philosophy. Assures all field and affected area personnel are accounted for. Considers tactical response in accordance with incident management guides Deploys and executes spill control/response strategy resources to contain and control the spill incident, as per advice from the Emergency Coordinator / Incident Commander / Staging Area Manager / Deputy Division Commander (DTMI FOB).
Medical Evacuation Team	<ul style="list-style-type: none"> Manages all medical and transportation requirements related to injured personnel to an appropriate medical facility. <p><i>Refer to the Medical Evacuation Procedure (SO-91-IF-00020) for detailed descriptions of roles and responsibilities within the Medical Evacuation Team</i></p>

⁹ This role is fulfilled by the Offshore Installation Manager (OIM) or Vessel Master for vessel-based incidents.

Field-based position	Main responsibilities
Source Control Branch	<ul style="list-style-type: none"> Respond to incidents involving well loss of containment to stop the flow of oil to sea. <p><i>Refer to the Santos Source Control Planning and Response Guideline (DR-00-OZ-20001) for detailed descriptions of roles and responsibilities within the Source Control Branch.</i></p>
Wildlife Response Branch	<ul style="list-style-type: none"> Respond to oiled wildlife incidents to minimise the impacts to wildlife. <p><i>Refer to the Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) for a description of the wildlife response branch, and the Santos Incident Management Handbook for detailed descriptions of roles and responsibilities within the Wildlife Response Branch.</i></p>
Monitoring Branch	<ul style="list-style-type: none"> Monitors the effectiveness of response strategies, and impacts and recovery to sensitive receptors from an oil spill and associated response actions. <p><i>Refer to the North West Shelf OSM-BIP (7715-650-ERP-0002) for detail on Operational and Scientific Monitoring Team roles and responsibilities.</i></p>

Table 5-4: WA Department of Transport and Major Infrastructure roles embedded within Santos' CMT / IMT

DTMI roles embedded within Santos' CMT/IMT	Main Responsibilities
<p>DTMI Liaison Officer (before DTMI assuming role of Control Agency)</p> <p>Deputy Incident Controller – State Waters (after DTMI assumes role of Control Agency)</p>	<ul style="list-style-type: none"> Facilitate effective communications between DTMI's State Marine Pollution Coordinator (SMPC)/ State Maritime Environmental Emergency Coordinator (SMEEC)/ the Incident Controller and Santos' appointed CMT Lead/Incident Commander. Provide enhanced situational awareness to DTMI of the incident and the potential impact on State waters. Assist in the provision of support from DTMI to Santos. Facilitate the provision of technical advice from DTMI to Santos' Incident Commander as required.
Media Liaison Officer	<ul style="list-style-type: none"> Provide a direct liaison between the Santos Media team and DTMI IMT Media team. Facilitate effective communications and coordination between the Santos and DTMI media teams. Assist in the release of joint media statements and conduct of joint media briefings. Assist in the release of joint information and warnings through the DTMI Information and Warnings team. Offer advice to the Santos Media Coordinator on matters pertaining to DTMI and wider Government media policies and procedures.

Table 5-5: Santos personnel roles embedded within the State MEECC/ DTMI IMT/ FOB

Santos roles embedded within the State MEECC/ DTMI IMT/ FOB	Main Responsibilities
CMT Liaison Officer	<ul style="list-style-type: none"> Provide a direct liaison between the Santos CMT and the State MEECC. Facilitate effective communications and coordination between the Santos CMT Lead and the SMEEC. Offer advice to SMEEC on matters pertaining to Santos crisis management policies and procedures.
Deputy Incident Controller	<ul style="list-style-type: none"> Provide a direct liaison between the Santos IMT and the DTMI IMT. Facilitate effective communications and coordination between the Santos Incident Commander and the DTMI Incident Controller. Offer advice to the DTMI Incident Controller on matters pertaining to the Santos incident response policies and procedures. Offer advice to the Safety Coordinator on matters pertaining to Santos safety policies and procedures, particularly as they relate to Santos employees or contractors operating under the control of the DTMI IMT.
Deputy Intelligence Officer	<ul style="list-style-type: none"> As part of the DTMI Intelligence Team, assist the Intelligence Officer in the performance of their duties in relation to situation and awareness. Facilitate the provision of relevant modelling and predications from the Santos IMT. Assist in the interpretation of modelling and predictions originating from the Santos IMT.

Santos roles embedded within the State MEECC/DTMI IMT/ FOB	Main Responsibilities
	<ul style="list-style-type: none"> Facilitate the provision of relevant situation and awareness information originating from the DTMI IMT to the Santos IMT. Facilitate the provision of relevant mapping from the Santos IMT. Assist in the interpretation of mapping originating from the Santos IMT. Facilitate the provision of relevant mapping originating from the Santos IMT.
Deputy Planning Officer	<ul style="list-style-type: none"> As part of the DTMI Planning Team, assist the Planning Officer in the performance of their duties in relation to the interpretation of existing response plans and the development of incident action plans and related sub-plans. Facilitate the provision of relevant IAP and sub-plans from the Santos IMT. Assist in the interpretation of the Santos OPEP from Santos. Assist in the interpretation of the Santos IAP and sub-plans from the Santos IMT. Facilitate the provision of relevant IAP and sub-plans originating from the DTMI IMT to the Santos IMT. Assist in the interpretation of Santos' existing resource plans. Facilitate the provision of relevant components of the resource sub-plan originating from the DTMI IMT to the Santos IMT. <p><i>(Note this individual must have intimate knowledge of the relevant Santos OPEP and planning processes).</i></p>
Environment Support Officer	<ul style="list-style-type: none"> As part of the Intelligence Team, assist the Environment Coordinator in the performance of their duties in relation to the provision of environmental support into the planning process. Assist in the interpretation of the Santos OPEP and relevant Tactical Response Plan (TRPs). Facilitate in requesting, obtaining and interpreting environmental monitoring data originating from the Santos IMT. Facilitate the provision of relevant environmental information and advice originating from the DTMI IMT to the Santos IMT.
Deputy Public Information Officer¹⁰	<ul style="list-style-type: none"> As part of the Public Information Team, provide a direct liaison between the Santos Media team and DTMI IMT Media team. Facilitate effective communications and coordination between Santos and DTMI media teams¹¹ Assist in the release of joint media statements and conduct of joint media briefings. Assist in the release of joint information and warnings through the DTMI Information & Warnings team. Offer advice to the DTMI Media Coordinator on matters pertaining to Santos media policies and procedures. Facilitate effective communications and coordination between Santos and DTMI Community Liaison teams Assist in the conduct of joint community briefings and events. Offer advice to the DTMI Community Liaison Coordinator on matters pertaining to Santos community liaison policies and procedures. Facilitate the effective transfer of relevant information obtained from the Contact Centre to the Santos IMT.
Deputy Logistics Officer	<ul style="list-style-type: none"> As part of the Logistics Team, assist the Logistics Officer in the performance of their duties in relation to the provision of supplies to sustain the response effort. Facilitate the acquisition of appropriate supplies through Santos' existing OSRL, AMOSC and private contract arrangements. Collects Request Forms from DTMI to action via the Santos IMT.

¹⁰ In the event of an incident, Santos can provide the DTMI IMT with a list of agencies, organisations, representative bodies, and other stakeholders that were consulted in the development of the Environment Plan to assist DTMI with the management and provision of public information.

¹¹ In the event DTMI assumes the role of Control Agency in State Waters, Santos acknowledges that the DTMI IMT will be the lead IMT for public information and warnings and community liaison. In such circumstances, Santos retains the right to manage its own media interests, but acknowledges the strong preference for DTMI and Santos to issue joint media statements and conduct joint media conferences and the importance of close liaison between the respective Media Teams.

Santos roles embedded within the State MEECC/DTMI IMT/ FOB	Main Responsibilities
	<i>Note this individual must have intimate knowledge of the relevant Santos logistics processes and contracts.</i>
Deputy Waste Management Coordinator	<ul style="list-style-type: none"> As part of the Operations Team, assist the Waste Management Coordinator in the performance of their duties in relation to the provision of the management and disposal of waste collected in State waters. Facilitate the acquisition of appropriate services and supplies through Santos' existing private contract arrangements related to waste management and in line with legislative and regulatory requirements. Collect Waste Collection Request Forms from DTMI to action via the Santos IMT.
Deputy Finance Officer	<ul style="list-style-type: none"> As part of the Finance Team, assist the Finance Officer in the performance of their duties in relation to the setting up and payment of accounts for those services acquired through Santos' existing OSRL, AMOSC and private contract arrangements. Facilitate the communication of financial monitoring information to Santos to allow them to track the overall cost of the response. Assist the Finance Officer in the tracking of financial commitments through the response, including the supply contracts commissioned directly by DTMI and to be charged back to Santos.
Deputy Operations Officer	<ul style="list-style-type: none"> As part of the Operations Team, assist the Operations Officer in the performance of their duties in relation to the implementation and management of operational activities undertaken to resolve an incident. Facilitate effective communications and coordination between the Santos Operations Section and the DTMI Operations Section. Offer advice to the DTMI Operations Officer on matters pertaining to Santos incident response procedures and requirements. Identify efficiencies and assist to resolve potential conflicts around resource allocation and simultaneous operations of Santos and DTMI response efforts.
Deputy Division Commander (FOB)	<ul style="list-style-type: none"> As part of the Field Operations Team, assist the Division Commander in the performance of their duties in relation to the oversight and coordination of field operational activities undertaken in line with the IMT Operations Section's direction. Provide a direct liaison between Santos' Forward Operations Base/s (FOB/s) and the DTMI FOB. Facilitate effective communications and coordination between Santos Operations Section Chief and the DTMI Division Commander. Offer advice to the DTMI FOB Operations Commander on matters pertaining to Santos incident response policies and procedures. Assist the Safety Coordinator deployed in the FOB in the performance of their duties, particularly as they relate to Santos employees or contractors. Offer advice to the Senior Safety Officer deployed in the FOB on matters pertaining to Santos safety policies and procedures.

5.3 Cost Recovery

As required under Section 571(2) of the OPGGS Act 2006, Santos has financial assurances in place to cover any costs, expenses and liabilities arising from carrying out its petroleum activities, including major oil spills. This includes costs incurred by relevant Control Agencies (e.g. DTMI) and third-party spill response service providers.

5.4 Training and Exercises

In order to refresh IMT roles and responsibilities and provide familiarisation with OPEP processes and arrangements, IMT workshops are conducted as per the Santos Offshore Division Incident and Crisis Management Training and Exercise Plan (7700-294-DIN-0005).

To familiarise the IMT with functions and processes, an OPEP Desktop and Activation Exercise is undertaken as per the Santos Offshore Division Incident and Crisis Management Training and Exercise Plan (7700-294-DIN-0005). Exercise planning takes into consideration virtual/remote access requirements.

All workshops and exercises undertaken are recorded in the Santos EHS Toolbox, with the key recommendations recorded and tracked.

5.4.1 Incident Management Team Training and Exercises

Santos provides training to its personnel to fill all required positions within the IMT.

Competency is maintained through participation in regular response exercises and workshops. Exercise and training requirements for Santos' IMT members are summarised in Table 5-6.

Table 5-6: Training and exercise requirements for incident management team positions

IMT Role	Exercise	Training
Incident Commander	One Level 3 exercise annually or two Level 2 exercises annually ¹²	<ul style="list-style-type: none"> PMAOMIR418 Co-ordinate Incident Response AMOSOC – IMO3 equiv. Oil Spill Response Command and Control
Operations Section Chief / Source Control Branch Director		<ul style="list-style-type: none"> PMAOMIR322 Manage Incident Response Information AMOSOC – IMO3 equiv. Oil Spill Response Command and Control
Planning Section Chief Logistics Section Chief Environment Unit Leader		<ul style="list-style-type: none"> PMAOMIR322 Manage Incident Response Information AMOSOC – IMO2 equiv. Oil Spill Management
Safety Officer Supply Unit Leader Geographic Information System (GIS) Team Leader Data Manager ¹³ HR Officer Situation Unit Leader Documentation Unit Leader IMT Log & Situation		<ul style="list-style-type: none"> PMAOMIR322 Manage Incident Response Information AMOSOC – Oil Spill Response Familiarisation Training
Relief Well Team Leader Well Intervention Team Leader		<ul style="list-style-type: none"> Drilling Well Control accredited training through International Well Control Forum (IWCF) Level 4 (Well Site Supervisor Training)

5.4.2 Oil spill responder training

Santos has an internal capability of trained oil spill responders who can be deployed in the field in a spill response and has access to external, trained spill responder resources (Table 5-7).

Table 5-7: Spill responder personnel resources

Responder	Role	Training	Available Number
Santos AMOSC Core Group Responders	Santos personnel trained and competency assessed by AMOSC as the AMOSC Core Group. Deployed by IMT for spill response operations.	AMOSOC Core Group Workshop (refresher training undertaken every two years). AMOSOC – IMO1 equiv. Oil Spill Response Operations and/or IMO2 equiv. Oil Spill Response Management	16
Santos Facility Emergency Response Teams	Present at Varanus Island facilities for first-strike response to incidents.	Internal Santos training and exercises as defined in each facility's Emergency Response Plan Emergency Commander to have AMOSC – Oil Spill	One ER team per operational facility per shift

¹² All IMT members are required to participate in at least one Level 3 exercise every two years

¹³ Data Manager is an administrative support role, not an IMT role, but is included here for completeness

Responder	Role	Training	Available Number
		Response Familiarisation Training.	
Santos Aerial Observers	Undertake aerial surveillance of spill. Deployed by IMT in the aerial surveillance aircrafts.	AMOSC – Aerial Surveillance Course (refresher training undertaken triennially).	7
Santos IMT	Provides a pool of Santos employees trained to perform leadership roles in the Santos IMT.	As per the Santos training matrix.	87
AMOSC Core Group Oil Spill Responders	Industry personnel as the AMOSC Core Group, available to Santos under the AMOSPlan. For providing incident management (IMT) and operations (field response) assistance.	AMOSC Core Group Workshop (refresher training undertaken every two years). AMOSC – IMO1 equiv. Oil Spill Response Operations and/or IMO2 equiv. Oil Spill Response Management	As defined in Core Group Member Reports ¹⁴ Target to maintain at least 100 members (minimum 84, maximum 140) (Ref.: AMOSC Core Group Program and Policies V2.0) (AMOSC, 2024)
OSRL Oil Spill Response Personnel	Oil Spill Response Ltd professionals, providing technical, incident management and operational advice and assistance available under Santos-OSRL contract.	As per OSRL training and competency matrix.	18 responders guaranteed Up to 80 dedicated responders available, may be approved under best endeavours
TRG Response Personnel	Emergency response personnel provided by arrangement with Santos	As per TRG training and competency matrix	60
AMOSC Staff	Professionals, providing technical, incident management and operational advice and assistance available under Santos-AMOSC contract.	As per AMOSC training and competency matrix.	16 ¹⁵
Santos Source Control Personnel	Management and coordination of source control strategies including relief well drilling and subsea intervention	Santos Source Control Personnel IWCF Level 4 certification	60 ¹⁶
Oiled Wildlife Response Roles	Refer to Section 16 and Appendix M		
OSM Services Provider	Refer to Section 17 and Section 9.1 of the Santos North West Shelf OSM-BIP (7715-650-ERP-0002).		
Level 1 Oiled Wildlife Responders (Workforce Hire)	Provide oiled wildlife support activities under supervision.	No previous training required; on the job training provided.	Nominally over 1,000
Shoreline clean-up personnel (Workforce Hire)	Manual clean-up activities under supervision.		

In addition to the resources listed in Table 5-7, the following resources are available for spill response and may be activated by the relevant Control Agency:

¹⁴ A total of 121 personnel in the Core Group as of January 2026 (AMOSC Member's website), plus 16 AMOSC staff members (AMOSPlan 2021)

¹⁵ AMOSC has a permanent staff of 16 available on a 24/7 basis (AMOSPlan 2021), 12 of which are available for field response, and 4 for admin/management support roles.

¹⁶ Made up of D&C staff that are members of the Santos OSR Team, and other D&C staff.

- **National Plan: National Response Team** – Trained oil spill response specialists, including aerial observers, containment and recovery crews, and shoreline clean-up personnel, will be deployed under the direction of the relevant Control Agency in a response. The National Response Team is trained and managed in accordance with the National Response Team Policy, approved by the National Plan Strategic Coordination Committee (AMSA 2021b).
- **WA SHP-MEE: State Response Team (SRT)** – Oil pollution response team available to assist under the jurisdiction of the DTMI in State waters. SRT members remain trained and accredited in line with the SHP-MEE requirements (WA DoT 2024a).

In the event of a spill, the trained spill responders listed in Table 5-7 would be required to undertake various roles in key spill response operations, including monitor and evaluate, shoreline protection, shoreline clean-up and oiled wildlife response.

In the event of a spill, Team Leader roles for protection and deflection and shoreline clean-up would be filled through Santos' AMOSC Core Group Responders and then industry Core Group Responders.

5.5 Response Testing Arrangements and Audits

Santos has oil spill response testing arrangements in place in accordance with the Santos Offshore Oil Spill Response Readiness Guideline (SO-91-OI-20001) which provides a process for continual monitoring of OSRO capability. This also includes regular oil spill response equipment inventory checks from the various sources. Testing of key response provider arrangements may be done as part of larger exercises or as standalone tests where the capability and availability of resources through the response provider are assessed against the performance requirement.

5.5.1 Testing Arrangements

Not all spill preparedness and response arrangements will be tested simultaneously. The frequency of testing will relate to the potential spill level, spill risk and complexity of response.

Santos employs a range of tests to ensure that the various response arrangements function as required. These tests include:

- contract/plan review
- audit
- notification/communication check
- desktop exercise
- deployment exercise
- level 2/3 IMT Exercise

The above tests and the testing schedule are detailed in full within the Santos Offshore Oil Spill Response Readiness Guideline (7710-650-GDE-0001); an excerpt of the testing arrangements plan is provided in Figure 5-2. Objectives are set for the various tests identified for each of the response arrangements. The effectiveness of response arrangements against these objectives are assessed using pre-identified Key Performance Indicators (KPIs).

#	Response arrangements and critical components	Type of test	Schedule	Objectives	KPIs
2.	Monitor and Evaluate				
	Monitor and Evaluate - Vessel Surveillance a) Access to vessels	Review – Contract / Agreement	Annually	To confirm access to vessels for surveillance	Review to confirm Master Service Agreements (MSAs) with vessel providers to gain access to vessels
	Monitor and Evaluate - Aerial Surveillance a) Access to aircrafts	Review – Contract / Agreement	Annually	To confirm access to aircrafts for surveillance	Review to confirm Master Service Agreements (MSAs) with aircraft providers to gain access to aircrafts for surveillance
	Monitor and Evaluate - Aerial Surveillance b) Access to trained aerial observers	Review – Contract / Agreement	Annually	To confirm access to trained aerial observers	Review to confirm access to trained aerial observers through; <ul style="list-style-type: none"> Trained Santos personnel or AMOSC Participant Member Contract or OSRL Associate Member Contract
	Monitor and Evaluate - Unmanned Aerial Vehicles (UAV) a) Access to UAV providers	Review – Contract / Agreement	Annually	To confirm access to UAV providers	Review to confirm access to UAV providers through; <ul style="list-style-type: none"> AMOSC Participant Member Contract or OSRL Associate Member Contract
	Monitor and Evaluate - Fauna observations a) Maintain a list of air charter companies that could provide fauna observation services	Review – List of air charter companies for fauna observations	Annually	To confirm that a list of air charter companies that could provide fauna observation services is maintained	Review to confirm that a list of air charter companies that could provide fauna observation services is maintained
	Monitor and Evaluate – Tracking Buoys a) Access to Tracking Buoys	Review – Contract / Agreement	Prior to activity commencement	To confirm access to tracking buoys	Review to confirm access to Santos owned Tracking Buoys
	Monitor and Evaluate - Tracking Buoys b) Response readiness	Communication/Tracking software Test	6-monthly	To confirm response readiness for Tracking buoys	Tracking Buoys pass functional test as per operational instructions
	Monitor and Evaluate - Oil Spill Modelling a) Access to oil spill modelling service provider	Review – Contract / Agreement	Annually	To confirm access to emergency response oil spill modelling services	Review to confirm access to emergency oil spill modelling services through maintenance of service provision contract

Figure 5-2: Excerpt of testing arrangements plan

Source: Taken from Santos Offshore Oil Spill Response Readiness Guideline (7710-650-GDE-0001)

All testing activities are documented, and all reports generated will be saved in Santos’s EHS Toolbox system. Once completed, records of testing arrangements are entered into the Santos EHS Toolbox and any actions, recommendations or corrective actions identified are assigned a responsible party for completion and tracked to closure. The status of completion is tracked through the ‘Action module’ in the EHS Toolbox and communicated widely through monthly EHS KPI reporting.

Source control testing arrangements have been formulated with reference to industry guidelines including the Australian Energy Producers (AEP) (formerly Australian Petroleum Production & Exploration Association [APPEA]) Offshore Titleholders Source Control Guideline (June 2021) and the NOPSEMA Information Paper: Source Control Planning and Procedures IP1979 (NOPSEMA 2024).

Source control objectives and KPIs are developed in order to test the response arrangements specified in this OPEP and the Source Control Planning and Response Guideline (DR-00-OZ-20001). In addition to objectives and KPIs, test frequency and type of test are also detailed in the Santos Offshore Oil Spill Response Readiness Guideline (7710-650-GDE-0001).

For each source control exercise, a copy of the exercise materials is recorded in the EHS toolbox. Action items identified are tracked in EHS toolbox to completion. Lessons learnt are incorporated into Santos guidelines and procedures as part of a process of continual improvement.

5.5.2 Audits

Oil spill response audits will follow the Santos Assurance Management Standard (SMS-MS15.1) and are scheduled as per the Santos annual Assurance Schedule. Audits will help identify and address any deficiencies in systems and procedures. At the conclusion of the audit, any opportunities for improvement and corrective actions (non-conformances) will be formally noted and discussed, with corrective actions developed and accepted. In some cases, audits may conclude with potential amendments to the OPEP.

Multiple oil spill response organisations are engaged by Santos. These organisations are responsible for the audit and maintenance of their own capacity. The Santos Emergency Response Coordinator (Oil Spill) maintains oversight of the audit and maintenance programs of its service providers through regular reporting requirements and any third-party assurance activities. These include:

- The deployment readiness and capability of AMOSC’s oil spill response equipment and resources in Geelong, Fremantle, Exmouth and Broome are audited every two years under the direction of AMOSC’s participating

members. The intent is to provide assurances to Santos and associated members about AMOSC's ability to respond to an oil spill incident as per the methods and responsibilities defined in OPEPs and AMOSC's Service Level Statement.

- The deployment readiness and capability of OSRL's oil spill response equipment and personnel are audited every two years by the Oil Spill Response Coordinator. The intent of this audit is to provide assurances to Santos of OSRL's ability to respond to an oil spill incident as per the methods and responsibilities defined in Santos' OPEPs and OSRL's SLA.

6. Response Strategy Selection

6.1 Spill Scenarios

This OPEP outlines strategies, actions and supporting arrangements applicable for all credible oil spill events associated with VGA-4H GI ST1 well suspension / decommissioning activities. Two credible spill scenarios have been identified in the VGCN VGA-4HG1 Well Decommissioning EP (refer to EP Section 7) to represent the worst-case spills from a response perspective, taking into account the following characteristics:

- the hydrocarbon types that could be spilt during VGA-4H GI ST1 Well suspension / decommissioning activities
- the maximum credible release volumes
- the greatest spatial extent from a response perspective based on surface oil and shoreline accumulation as these are the key factors contributing to response
- proximity to sensitive receptors, shorelines and State/Commonwealth boundaries etc.

The worst-case credible spill risks selected to inform this OPEP and taken forward for oil spill modelling are presented in Table 6-1. The VGCN VGA-4HG1 Well Decommissioning EP (Section 7.5) details the derivation of these maximum credible spills.

For a description of the characteristics and weathering behaviour associated with hydrocarbons that may unintentionally be released, refer to Appendix A.

Table 6-1: Maximum credible spill scenarios for VGA-4H GI ST1 Well Suspension / Decommissioning Activities

Worst-case credible spill scenario	Approx. depth of spill	Hydrocarbon type	Max. credible volume released (m ³)	Release duration
Loss of well control causing crude release.	Surface	Van Gogh Crude	8,073 m ³	77 days
Surface spill from vessel collision	Surface	MDO	325m ³	1 hour

6.2 Response Planning Thresholds

Environmental impact assessment thresholds are addressed in Section 7 of the VGCN VGA-4HG1 Well Decommissioning EP. In addition to the environmental impact assessment thresholds, response thresholds have been developed for response planning to determine the conditions that response strategies would be effective. These thresholds are provided as a guide for response planning based on case studies that have demonstrated some response strategies require certain oil spill thicknesses and conditions to be effective.

For example, containment and recovery effectiveness drops significantly with reduced oil thickness (McKinney and Caplis, 2017; NOAA, 2013). McKinney and Caplis (2017) tested the effectiveness of various oil skimmers at different oil thicknesses. Their results showed that the oil recovery rate of skimmers dropped significantly when oil thickness was <50 g/m².

Surface chemical dispersants are most effective on hydrocarbons that are at a thickness of 50–100 g/m² on the sea surface. EMSA (2010) recommends thin layers of spilled hydrocarbons should not be treated with dispersant. This includes Bonn Agreement Oil Appearance Codes (BAOAC) 1–3 (EMSA, 2010).

AMSA indicate typical windows of opportunity for mechanical recovery and dispersant application, where minimum slick thicknesses of 100 g/m² and 50 g/m² are cited, respectively (AMSA, 2023).

Response planning thresholds used in this OPEP are provided in Table 6-2.

Table 6-2: Hydrocarbon thresholds for response planning

Hydrocarbon concentration (g/m ²)	Description
≥1	Estimated minimum floating hydrocarbon threshold used (in part) for operational and scientific monitoring planning, as described in Section 2.1 of the North West Shelf OSM-BIP (7715-650-ERP-0002)

Hydrocarbon concentration (g/m ²)	Description
≥50	Estimated minimum floating hydrocarbon threshold for containment and recovery and surface dispersant application
≥100	Estimated floating hydrocarbon threshold for effective containment and recovery and surface dispersant application. Estimated minimum shoreline accumulation threshold for shoreline clean-up.

6.3 Spill Modelling Results

6.3.1 Stochastic modelling results

Two worst case spill scenarios (one surface crude release from a LOWC and one MDO release arising from a vessel collision) were modelled for the VGA-4H GI ST1 well suspension / decommissioning activity using a stochastic approach.

The vessel collision scenario, involving a surface MDO release, was also modelled by RPS (2024). One hundred spill simulations were undertaken for each season (300 in total), and the resulting MDO spill was tracked for a period of 30 days.

The surface crude release from a LOWC was modelled by RPS (2025). One hundred spill simulations were undertaken for each season (summer, winter and transitional), 300 simulations in total for the scenario using a range of environmental conditions sampled from a 10-year metocean dataset (2010–2019). The G1 crude oil release scenario was tracked for a total period of 91 days.

This stochastic modelling provides an annualised assessment of potential floating oil, shoreline accumulation, and hydrocarbon exposure in the water column for both scenarios and supports oil spill response planning for the VGA-4H GI ST1 Well Decommissioning OPEP.

6.3.1.1 MDO Scenario

A worst-case marine diesel oil (MDO) release scenario was modelled to represent a vessel collision during VGA-4H GI ST1 well suspension / decommissioning activities. This scenario investigated the potential exposure to surrounding regions from a 325 m³ surface release of MDO over one hour to simulate a worst-case vessel collision. The release was run for 30 days to allow for concentrations to weather and disperse below the minimum threshold. The modelling assumed no mitigation efforts were undertaken to otherwise affect the natural transport and fate of the oil.

The results show that floating oil concentrations ≥1 g/m² could extend up to 88 km from the release point, with the distance reducing to 58 km and 20 km as the thresholds increased to ≥10 g/m² and ≥50 g/m², respectively. Ningaloo – Outer NW was the only Environmental Value Area (EVA) predicted to be contacted by floating oil at ≥1 g/m², ≥10 g/m² and ≥ 50 g/m² with probabilities of 6.3%, 3.33% and 1%, respectively. The minimum time to contact was predicted to be 4 hours at the ≥1 g/m² and ≥10 g/m² thresholds, and 6 hours for the ≥ 50 g/m² threshold. WA State waters were not predicted to be contacted by floating oil.

Shoreline oil accumulation was not predicted to occur at any EVA, at or above the ≥10 g/m² threshold in any of the 300 simulations.

Entrained hydrocarbons ≥1,000 ppb were predicted up to 47 km from the release point, with the Ningaloo – Outer NW the only EVA predicted to be contacted, recording a 12% probability of exposure and a minimum time to first contact of 4 hours. WA State waters were not predicted to be contacted by entrained hydrocarbons ≥1,000 ppb.

Dissolved hydrocarbons at concentrations ≥10 ppb may reach up to 261 km, reducing to 111 km for the ≥50 ppb threshold. No dissolved hydrocarbon at concentrations ≥400 ppb were predicted. Ningaloo – Outer NW recorded the highest probability of dissolved hydrocarbon exposure (16.7% for ≥10 ppb, reducing to 2.3% for ≥50 ppb), with the earliest exposure predicted within 4 hours of the commencement of a spill. WA State waters were predicted to have a 0.33% probability of contact by dissolved hydrocarbons at ≥10 ppb, with a minimum time to contact of 5 days, 22 hours.

Refer to Table 6-3 for a summary of results.

6.3.1.2 LOWC Scenario

A worst-case loss of well control (LOWC) scenario was modelled to represent an uncontrolled release of Van Gogh crude during VGA-4H GI ST1 well suspension / decommissioning activities. This scenario investigated the potential exposure to surrounding regions from a 50,780 bbl (~8,073 m³) surface release of Van Gogh crude over 77 days

(~660 bbl./day). The modelling was run for 91 days to capture the weathering and fate of the oil, with no mitigation measures assumed that would otherwise affect the natural transport and behaviour of the crude.

The results show that floating oil concentrations $\geq 1 \text{ g/m}^2$ could extend up to 1,052 km from the release point, with the distance reducing to 266 km and 3 km as the thresholds increased to $\geq 10 \text{ g/m}^2$ and $\geq 50 \text{ g/m}^2$, respectively. The highest probability of floating oil exposure at $\geq 1 \text{ g/m}^2$ was recorded for the Ningaloo – Offshore EVA (100%) (as the release location lies within this EVA), followed by Ningaloo – Outer NW (98.9%). The earliest times to contact for floating oil $\geq 1 \text{ g/m}^2$ were also for Ningaloo – Offshore (13 days, 18 hours) and Ningaloo- Outer NW (20 days, 23 hours). The highest probability of floating oil exposure at $\geq 10 \text{ g/m}^2$ was recorded for the Ningaloo – Offshore (99.9%) and Ningaloo – Outer NW (24.31%) EVAs. The earliest times to contact for floating oil $\geq 10 \text{ g/m}^2$ were also for Ningaloo – Offshore (24 days, 6 hours) and Ningaloo- Outer NW (38 days, 22 hours). Ningaloo – Offshore was the only EVA predicted to be contacted by floating oil $\geq 50 \text{ g/m}^2$, with a probability of 5.66% and minimum time to contact of 58 days, 10 hours.

WA State waters were predicted to be contacted by floating oil at $\geq 1 \text{ g/m}^2$ and $\geq 10 \text{ g/m}^2$, with probabilities of 15.32% and 1%, respectively. Minimum time to contact was predicted to be 24 days, 20 hours for floating oil $\geq 1 \text{ g/m}^2$, and 42 days, 2 hours for floating oil $\geq 10 \text{ g/m}^2$.

Ningaloo Coast North and the Montebello Islands were predicted to have the highest probability for shoreline accumulation at $\geq 10 \text{ g/m}^2$, at 28.31% and 20.65%. The minimum time for shoreline accumulation $\geq 10 \text{ g/m}^2$ was predicted for Ningaloo Coast North (9 days, 4 hours). At the $\geq 100 \text{ g/m}^2$ threshold, Ningaloo Coast North (13.65%) and the Muiron Islands (9.99%) were predicted to have the highest probability of contact, with the minimum time to contact predicted for Ningaloo Coast North (23 days, 13 hours). The maximum volume of shoreline accumulation at $\geq 100 \text{ g/m}^2$ predicted for any EVA was $1,012 \text{ m}^3$ at Ningaloo Coast North, while the maximum total volume of shoreline accumulation for all EVAs from a single simulation was predicted to be $1,702.32 \text{ m}^3$ at the $\geq 100 \text{ g/m}^2$ threshold.

Entrained hydrocarbons $\geq 1,000 \text{ ppb}$ were predicted up to 7 km from the release point, with the Ningaloo – Offshore EVA recording the highest probability of exposure (93.6%). No contact with WA State waters was predicted.

Dissolved hydrocarbons were not predicted at or above the 10 ppb threshold across the 300 simulations for any EVA.

Refer to Table 6-4 for summary of results.

Table 6-3: Summary of a floating oil exposure and shoreline accumulation for a surface release of MDO from a vessel collision

Receptor Contacted	Probability (%) of floating oil at concentrations $\geq 1 \text{ g/m}^2$ [^]	Min. time for floating oil at concentrations $\geq 1 \text{ g/m}^2$ hours (days) [^]	Probability (%) of floating oil at concentrations $\geq 50 \text{ g/m}^2$	Min. time for floating oil at concentrations $\geq 50 \text{ g/m}^2$ hours (days)	Probability (%) of shoreline accumulation at concentrations $\geq 10 \text{ g/m}^2$ [^]	Min. time for shoreline accumulation at concentrations $\geq 10 \text{ g/m}^2$ hours (days) [^]	Maximum accumulated volume (m ³) along this shoreline $\geq 10 \text{ g/m}^2$ [^]	Max length of shoreline accumulation $\geq 10 \text{ g/m}^2$ [^]	Probability (%) of shoreline accumulation at concentrations $\geq 100 \text{ g/m}^2$	Min. time for shoreline accumulation at concentrations $\geq 100 \text{ g/m}^2$ hours (days)	Maximum accumulated volume (m ³) along this shoreline $\geq 100 \text{ g/m}^2$	Max length of shoreline accumulation $\geq 100 \text{ g/m}^2$
Ningaloo-Outer NW	6.33	4	1.00	6	NC	NC	NC	NC	NC	NC	NC	NC

Source: RPS, 2024

NC = No Contact

[^] = low threshold to inform operational and scientific monitoring response and capability, presented in Section 17 and Appendix N

 Submerged receptor

Table 6-4: Summary of floating oil exposure and shoreline accumulation above response planning thresholds for a surface release of Van Gogh Crude from a LOWC (RPS, 2025)

Receptor contacted	Probability (%) of floating oil at concentrations $\geq 1 \text{ g/m}^2$ [^]	Min. time for floating oil at concentrations $\geq 1 \text{ g/m}^2$ hours (days) [^]	Probability (%) of floating oil at concentrations $\geq 50 \text{ g/m}^2$	Min. time for floating oil at concentrations $\geq 50 \text{ g/m}^2$ hours (days)	Probability (%) of shoreline accumulation at concentrations $\geq 10 \text{ g/m}^2$ [^]	Min. time for shoreline accumulation at concentrations $\geq 10 \text{ g/m}^2$ hours (days) [^]	Maximum accumulated volume (m ³) along this shoreline at $\geq 10 \text{ g/m}^2$ [^]	Max length (km) of shoreline accumulation at $\geq 10 \text{ g/m}^2$ [^]	Probability (%) of shoreline accumulation at concentrations $\geq 100 \text{ g/m}^2$	Min. time for shoreline accumulation at concentrations $\geq 100 \text{ g/m}^2$ hours (days)	Maximum accumulated volume (m ³) along this shoreline at $\geq 100 \text{ g/m}^2$	Max length of shoreline accumulation at $\geq 100 \text{ g/m}^2$
Abrolhos Islands Easter Group	NC	NC	NC	NC	0.67	1,455 (60 days, 15 hours)	<1	3	NC	NC	NC	NC
Abrolhos Islands Pelsaert Group	NC	NC	NC	NC	0.33	67 days, 9 hours	<1	1	NC	NC	NC	NC
Abrolhos Islands Wallabi Group	NC	NC	NC	NC	1.33	61 days, 6 hours	<1	3	NC	NC	NC	NC
Barrow-Montebello Surrounds	3.33	837 (34 days, 21 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Barrow Island	3.66	840 (35 days)	NC	NC	13.32	280 (11 days, 16 hours)	346	52	8.33	700 (29 days 4 hours)	343	38
Bedout Island	NC	NC	NC	NC	1.33	47 days, 21 hours	2	4	NC	NC	NC	NC
Brewis Reef	2.00	1,214 (50 days, 14 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Broome-Roebuck	NC	NC	NC	NC	1.33	1,617 (67 days, 18 hours)	22	45	0.67	1,824 (76 days)	9	6
Broome North Coast	NC	NC	NC	NC	1.33	1,644 (68 days, 12 hours)	23	57	0.33	2,163 (90 days, 3 hours)	3	2
Browse Island	NC	NC	NC	NC	0.67	2,131 (88 days, 19 hours)	<1	3	NC	NC	NC	NC
Camden Sound	NC	NC	NC	NC	0.33	2,021 (84 days, 5 hours)	2	9	NC	NC	NC	NC
Carnarvon - Inner Shark Bay	1.00	1,599 (66 days, 15 hours)	NC	NC	1.67	960 (40 days)	14	12	1.00	1,677 (69 days, 21 hours)	12	4
Carnarvon Canyon AMP	3.00	1,104 (46 days)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Christmas Island	NC	NC	NC	NC	3.66	1,574 (65 days, 14 hrs)	6	2	0.67	2,084 (86 d, 20 hrs)	2	1
Clerke Reef MP	NC	NC	NC	NC	6.99	1,231 (51 days, 7 hrs)	6	3	0.67	1,859 (77 d, 11 hrs)	3	2
Cod Bank	0.33	1,799 (74 days, 23 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA

Receptor contacted	Probability (%) of floating oil at concentrations $\geq 1 \text{ g/m}^2$ [^]	Min. time for floating oil at concentrations $\geq 1 \text{ g/m}^2$ hours (days) [^]	Probability (%) of floating oil at concentrations $\geq 50 \text{ g/m}^2$	Min. time for floating oil at concentrations $\geq 50 \text{ g/m}^2$ hours (days)	Probability (%) of shoreline accumulation at concentrations $\geq 10 \text{ g/m}^2$ [^]	Min. time for shoreline accumulation at concentrations $\geq 10 \text{ g/m}^2$ hours (days) [^]	Maximum accumulated volume (m ³) along this shoreline at $\geq 10 \text{ g/m}^2$ [^]	Max length (km) of shoreline accumulation at $\geq 10 \text{ g/m}^2$ [^]	Probability (%) of shoreline accumulation at concentrations $\geq 100 \text{ g/m}^2$	Min. time for shoreline accumulation at concentrations $\geq 100 \text{ g/m}^2$ hours (days)	Maximum accumulated volume (m ³) along this shoreline at $\geq 100 \text{ g/m}^2$	Max length of shoreline accumulation at $\geq 100 \text{ g/m}^2$
Dampier Archipelago	0.67	1,473 (61 days, 9 hours)	NC	NC	5.66	711 (29 days, 15 hours)	176	85	3.00	1,045 (43 days, 13 hours)	158	36
Eighty Mile Beach	NC	NC	NC	NC	1.33	1,458 (60 days, 18 hours)	22	24	0.67	1,971 (74 days, 15 hours)	15	9
Exmouth Gulf Coast	1.33	795 (33 days, 3 hours)	NC	NC	2.66	744 (31 days)	88	50	2.00	914 (38 days, 2 hours)	76	23
Exmouth Reef	1.00	1,946 (81 days, 2 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Gascoyne AMP	76.59	611 (25 days, 11 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Glomar Shoals	1.33	1,259 (52 days, 11 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Imperieuse Reef	NC	NC	NC	NC	9.32	1,037 (43 days, 5 hours)	44	19	4.00	1,366 (56 days, 22 hours)	43	11
Indonesia East and Timor Leste	NC	NC	NC	NC	0.67	2,030 (84 days, 14 hours)	2	7	NC	NC	NC	NC
Indonesia - West	NC	NC	NC	NC	0.33	2,102 (87 days, 14 hours)	<1	3	NC	NC	NC	NC
Kalbarri - Geraldton	NC	NC	NC	NC	0.33	2,146 (89 days, 10 hours)	<1	1	NC	NC	NC	NC
Karratha-Port Hedland	NC	NC	NC	NC	0.67	1,261 (52 days, 13 hours)	2	8	NC	NC	NC	NC
Kimberley Coast PMZ	NC	NC	NC	NC	0.67	1,880 (78 days, 8 hours)	2	11	NC	NC	NC	NC
King Sound	NC	NC	NC	NC	1.33	1,928 (80 days, 8 hours)	<1	1	NC	NC	NC	NC
Lowendal Islands	2.00	888 (37 days)	NC	NC	10.99	710 (29 days, 14 hours)	31	12	5.00	749 (31 days, 5 hours 30)	30	9
Middle Islands Coast	1.00	1,455 (60 days, 15 hours)	NC	NC	7.99	786 (32 days, 18 hours)	105	96	4.33	1,128 (47 days)	81	42
Montebello AMP	12.32	819 (34 days, 3 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Montebello Islands	3.33	897 (37 days, 9 hours)	NC	NC	20.65	482 (20 days, 2 hours)	243	36	9.66	738 (30 days, 18 hours)	241	25
Muiron Islands	6.99	800 (33 days, 8 hours)	NC	NC	19.65	385 (16 days, 1 hour)	100	23	9.99	747 (31 days, 3 hours)	96	15
Ningaloo - Offshore	100.00	330 (13 days, 18 hours)	5.66	1,402 (58 days, 10 hours)	NA	NA	NA	NA	NA	NA	NA	NA
Ningaloo - Outer Coast North	32.97	552 (23 days, 0 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Ningaloo - Outer NW	98.90	503 (20 days, 23 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Ningaloo Coast North	15.32	596 (24 days, 20 hours)	NC	NC	28.31	220 (9 days, 4 hours)	1,030	214	13.65	565 (23 days, 13 hours)	1,012	160
Ningaloo Coast South	0.67	1,771 (73 days, 19 hours)	NC	NC	4.66	865 (36 days, 1 hour)	23	71	1.00	1,682 (70 days, 2 hours)	5	2
Northern Islands Coast	0.67	1,264 (52 days, 16 hours)	NC	NC	7.99	625 (26 days, 1 hour)	98	74	5.00	761 (31 days, 17 hours)	79	32

Receptor contacted	Probability (%) of floating oil at concentrations $\geq 1 \text{ g/m}^2$ [^]	Min. time for floating oil at concentrations $\geq 1 \text{ g/m}^2$ hours (days) [^]	Probability (%) of floating oil at concentrations $\geq 50 \text{ g/m}^2$	Min. time for floating oil at concentrations $\geq 50 \text{ g/m}^2$ hours (days)	Probability (%) of shoreline accumulation at concentrations $\geq 10 \text{ g/m}^2$ [^]	Min. time for shoreline accumulation at concentrations $\geq 10 \text{ g/m}^2$ hours (days) [^]	Maximum accumulated volume (m ³) along this shoreline at $\geq 10 \text{ g/m}^2$ [^]	Max length (km) of shoreline accumulation at $\geq 10 \text{ g/m}^2$ [^]	Probability (%) of shoreline accumulation at concentrations $\geq 100 \text{ g/m}^2$	Min. time for shoreline accumulation at concentrations $\geq 100 \text{ g/m}^2$ hours (days)	Maximum accumulated volume (m ³) along this shoreline at $\geq 100 \text{ g/m}^2$	Max length of shoreline accumulation at $\geq 100 \text{ g/m}^2$
Outer Argo-Rowley Terrace AMP	1.33	1,755 (73 days, 3 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Penguin Bank	1.33	1,264 (52 days, 16 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Poivre Reef	1.67	1,122 (46 days, 18 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Port Hedland Eighty Mile Beach	NC	NC	NC	NC	2.00	1,099 (45 days, 19 hours)	10	36	0.33	1,610 (67 days, 2 hours)	2	1
Rankin Bank	5.33	1,109 (46 day, 5 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Ripple Shoals	1.33	1,257 (52 days, 9 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Rosily Shoals	3.33	1,357 (56 days, 13 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Roebuck-Eighty Mile Beach	NC	NC	NC	NC	2.00	1,548 (64 days, 12 hours)	94	63	0.67	1,776 (74 days)	81	40
Rowley Shoals surrounds	0.33	2,112 (88 days)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Scott Reef South	NC	NC	NC	NC	2.66	1,589 (66 days, 5 hours)	20	36	0.67	2,009 (83 days, 17 hours)	11	8
Shark Bay - Coast Outer	0.67	1,742 (72 days, 14 hours)	NC	NC	1.67	859 (35 days, 19 hours)	139	108	1.00	1,574 (65 days, 14 hours)	121	37
Shark Bay AMP	1.00	1,540 (64 days, 4 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Southern Islands Coast	3.00	1,113 (46 days, 9 hours)	NC	NC	12.99	277 (11 days, 13 hours)	658	157	1.00	769 (32 days, 1 hour)	631	99
Sultan Reef	2.66	1,349 (56 days, 5 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Thevenard Islands	4.33	888 (37 days, 0 hours)	NC	NC	7.33	246 (10 days, 6 hours)	42	14	5.00	895 (37 days, 7 hours)	42	14
Trap Reef	1.67	1,372 (57 days, 4 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Western Abrolhos AMP	0.67	1,589 (66 days, 5 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Western Shark Bay AMP	1.00	1,475 (61 days, 11 hours)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
WA State Waters	15.32	596 (24 days, 20 hours) ⁰	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA
Zuytdorp Cliffs - Kalbarri	NC	NC	NC	NC	1.00	1,624 (67 days, 16 hours)	2	6	NC	NC	NC	NC

Source: RPS, 2025

NA = Not Applicable for receptor

NC = No Contact

[^] = low threshold to inform operational and scientific monitoring response and capability, presented in Section 17 and Appendix N

Submerged receptor

Intertidal receptor

6.3.2 Deterministic Modelling Results

Deterministic modelling is a useful tool for response planning. It uses a single spill run selected from the group of stochastic runs to help understand the likely behaviour and impacts of a single simulation of a worst-case spill scenario. This allows for effective scaling of response strategies. To assist with the response planning, the following deterministic simulations were identified based on the stochastic LOWC modelling results;

- The maximum volume of oil ashore $\geq 10 \text{ g/m}^2$;
- Longest length of shoreline oil accumulation $\geq 10 \text{ g/m}^2$; and
- Largest area of floating oil $\geq 50 \text{ g/m}^2$

The results of this modelling are as described below and presented in Table 6-5.

Maximum volume of oil ashore $\geq 100 \text{ g/m}^2$

A spill simulation commencing during transitional conditions (run 11) on the 26th of September 2010 at 5 pm, resulted in the maximum volume of oil ashore, which was $1,830 \text{ m}^3$ at the $\geq 10 \text{ g/m}^2$ threshold. The maximum volume of shoreline oil accumulation $\geq 100 \text{ g/m}^2$ on a single EVA was 886 m^3 on Ningaloo Coast North with a predicted maximum shoreline length of 101 km at $\geq 100 \text{ g/m}^2$, followed by Southern Islands Coast with 631 m^3 ashore at $\geq 100 \text{ g/m}^2$ with a predicted maximum shoreline length of 95 km at $\geq 100 \text{ g/m}^2$. The maximum concentration of entrained hydrocarbons during this spill was 1,548 ppb at the Ningaloo Offshore EVA.

WA State waters were predicted to be contacted by floating oil $\geq 1 \text{ g/m}^2$ within 1,921 hours (80 d, 1 hrs).

Longest length of shoreline oil accumulation at, or above, 100 g/m^2

A spill simulation commencing during summer conditions (run 33) on the 27th of October 2010 at 6 pm, resulted in the longest length of shoreline oil accumulation, which was 617 km. There was no dissolved hydrocarbon exposure predicted \geq . The maximum volume of shoreline oil accumulation $\geq 100 \text{ g/m}^2$ on a single EVA was $1,012 \text{ m}^3$ on Ningaloo Coast North with a predicted maximum shoreline length of 160 km $\geq 100 \text{ g/m}^2$.

WA state Waters were predicted to be contacted by floating oil $\geq 1 \text{ g/m}^2$ within 1,183 hours (49 d, 7 hrs).

Largest Area of Floating Oil $\geq 50 \text{ g/m}^2$

A spill simulation commencing during summer conditions (run 95) on the 15th of January 2016 at 4 am, resulted in the maximum floating oil swept area over the entire simulation $\geq 50 \text{ g/m}^2$, which was approximately 3 km^2 . There was no dissolved hydrocarbon exposure predicted $\geq 10 \text{ ppb}$. Muiron Islands was the only EVA to record oil ashore, which was less than 1 m^3 .

Table 6-5: Summary of deterministic modelling results (RPS, 2025)

Receptor Contacted	Min time for floating oil hours (days)			Min. time for shoreline accumulation hours (days)			Maximum local accumulated concentration (g/m ²)	Maximum local accumulated volume (m ³)			Maximum length of shoreline contacted (km)			Entrained minimum time to receptor waters hours (days)	Maximum entrained hydrocarbon concentration ppb	Dissolved minimum time to receptor waters hours (days)			Maximum dissolved hydrocarbon concentration ppb
	≥1 g/m ² †	≥10 g/m ²	≥50 g/m ²	≥10 g/m ² †	≥100 g/m ²	≥1,000 g/m ²		≥10 g/m ² †	≥100 g/m ²	≥1,000 g/m ²	≥10 g/m ² †	≥100 g/m ²	≥1,000 g/m ²			≥10 ppb†	≥50 ppb	≥400 ppb	
Summary of EVAs exposed by the single surface LOWC simulation (transitional, run 11), which resulted in the maximum volume of oil ashore																			
Barrow Island	NC	NC	NC	1,940 (80 d, 20 hrs)	2,061 (85 d, 21 hrs)	NC	117	14	2	NC	34	1	NC	NC	<1	NC	NC	NC	NC
Brewis Reef	1,959 (81 d, 5 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	<1	NC	NC	NC	NC
Exmouth Gulf Coast	1,949 (81d,5 hrs)	NC	NC	1,964 (81d, 20 hrs)	1,974 (82d, 6 hrs)	2,011 (83d, 19 hrs)	1,040	88	74	11	48	21	1	NC	<1	NC	NC	NC	NC
Exmouth Reef	1,946 (81d, 2 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	<1	NC	NC	NC	NC
Lowendal Islands	NC	NC	NC	1,996 (83 d, 4 hrs)	NC	NC	54	<1	NC	NC	4	NC	NC	NC	<1	NC	NC	NC	NC
Middle Islands Coast	2,005 (83 d, 13 hrs)	NC	NC	1,997 (83 d, 5 hrs)	2,001 (83 d, 9 hrs)	NC	254	53	28	NC	78	20	NC	NC	<1	NC	NC	NC	NC
Montebello AMP	1,180 (49 d, 4 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	2	NC	NC	NC	NC
Montebello Islands	NC	NC	NC	1,929 (80 d, 9 hrs)	NC	NC	30	2	NC	NC	9	NC	NC	NC	<1	NC	NC	NC	NC
Muiron Islands	1,921 (80 d, 1 hrs)	NC	NC	1,307 (54 d, 11 hrs)	1,925 (80 d, 5 hrs)	1,930 (80 d, 10 hrs)	1,814	100	96	49	21	15	3	NC	4	NC	NC	NC	<1
Ningaloo – Offshore^	500 (20 d, 20 hrs)	712 (29 d, 16 hrs)	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,098 (45 d, 18 hrs)	1,548	NC	NC	NC	4
Ningaloo - Outer Coast North	1,913(79 d, 17 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	15	NC	NC	NC	<1
Ningaloo - Outer NW	566 (23 d, 14 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	114	NC	NC	NC	2
Ningaloo Coast North	1,927(80 d, 7 hrs)	NC	NC	1,932 (80 d, 12 hrs)	1,937 (80 d, 17 hrs)	1,937(80 d, 20 hrs)	4,757	927	886	686	189	101	34	NC	4	NC	NC	NC	<1
Ningaloo Coast South	NC	NC	NC	2,003 (83 d, 11 hrs)	NC	NC	94	3	NC	NC	6	NC	NC	NC	<1	NC	NC	NC	NC
Northern Islands Coast	NC	NC	NC	1,984(82 d, 16 hrs)	NC	NC	77	8	NC	NC	29	NC	NC	NC	<1	NC	NC	NC	NC
Outer Argo-Rowley Terrace AMP	1,797 (74 d, 21 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	2	NC	NC	NC	NC
Rankin Bank	1,228 (51 d, 4 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	<1	NC	NC	NC	NC
Rosily Shoals	1,950 (81 d, 6 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	<1	NC	NC	NC	NC
Southern Islands Coast	1,928 (80 d, 8 hrs)	NC	NC	1,908 (79 d, 12 hrs)	1,930 (80 d, 10 hrs)	1,955 (81 d, 11 hrs)	2,217	658	631	346	157	95	24	NC	3	NC	NC	NC	<1

Receptor Contacted	Min time for floating oil hours (days)			Min. time for shoreline accumulation hours (days)			Maximum local accumulated concentration (g/m ²)	Maximum local accumulated volume (m ³)			Maximum length of shoreline contacted (km)			Entrained minimum time to receptor waters hours (days)	Maximum entrained hydrocarbon concentration ppb	Dissolved minimum time to receptor waters hours (days)			Maximum dissolved hydrocarbon concentration ppb
	≥1 g/m ²	≥10 g/m ²	≥50 g/m ²	≥10 g/m ²	≥100 g/m ²	≥1,000 g/m ²		≥10 g/m ²	≥100 g/m ²	≥1,000 g/m ²	≥10 g/m ²	≥100 g/m ²	≥1,000 g/m ²			≥10 ppb [†]	≥50 ppb	≥400 ppb	
Thevenard Islands	1,954 (81 d, 10 hrs)	NC	NC	1,958 (81 d, 14 hrs)	1,960 (81 d, 16 hrs)	NC	208	12	11	NC	11	6	NC	NC	<1	NC	NC	NC	NC
WA State Waters*	1,921 (80 d, 1 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	4	NC	NC	NC	<1
Summary of EVAs exposed by the single surface LOWC simulation (summer, run 33), which resulted in the greatest length of shoreline oil accumulation																			
Barrow-Montebello Surrounds	1,369 (57 d, 1 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	<1	NC	NC	NC	NC
Barrow Island	1,788(74 d, 12 hrs)	NC	NC	1,236 (51 d, 12 hrs)	1,785 (74 d, 9 hrs)	NC	790	108	105	NC	41	30	NC	NC	<1	NC	NC	NC	NC
Clerke Reef MP	NC	NC	NC	1,589 (66 d, 5 hrs)	NC	NC	11	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Dampier Archipelago	NC	NC	NC	1,469 (61 d, 5 hrs)	NC	NC	21	<1	NC	NC	5	NC	NC	NC	<1	NC	NC	NC	NC
Exmouth Gulf Coast	NC	NC	NC	1,221 (50 d, 21 hrs)	1,231 (51 d, 7 hrs)	NC	483	41	30	NC	43	12	NC	NC	3	NC	NC	NC	<1
Gascoyne AMP	1,754 (73 d, 2 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	16	NC	NC	NC	<1
Imperieuse Reef MP	NC	NC	NC	1,535 (63 d, 23 hrs)	NC	NC	28	2	NC	NC	8	NC	NC	NC	NC	NC	NC	NC	NC
Kimberley Coast PMZ	NC	NC	NC	1,880 (78 d, 8 hrs)	NC	NC	25	2	NC	NC	11	NC	NC	NC	NC	NC	NC	NC	NC
King Sound	NC	NC	NC	2,053 (85 d, 13 hrs)	NC	NC	16	<1	NC	NC	1	NC	NC	NC	NC	NC	NC	NC	NC
Lowendal Islands	NC	NC	NC	1,252 (52 d, 4 hrs)	NC	NC	89	3	NC	NC	7	NC	NC	NC	<1	NC	NC	NC	NC
Middle Islands Coast	1,726(71 d, 22 hrs)	NC	NC	1,253 (52 d, 5 hrs)	1,264 (52 d, 16 hrs)	NC	510	105	81	NC	96	42	NC	NC	<1	NC	NC	NC	NC
Montebello AMP	1,500 (62 d, 12 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	<1	NC	NC	NC	NC
Montebello Islands	NC	NC	NC	1,252 (52 d, 4 hrs)	1,475 (61 d, 11 hrs)	NC	202	15	2	NC	30	1	NC	NC	<1	NC	NC	NC	NC
Muiron Islands	1,183 (49 d, 7 hrs)	NC	NC	1,176(49 d, 0 hrs)	1,181(49 d, 5 hrs)	NC	787	57	55	NC	21	13	NC	NC	8	NC	NC	NC	<1
Ningaloo – Offshore^	511 (21 d, 7 hrs)	753 (31 d, 9 hrs)	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	904 (37 d, 16 hrs)	1,902	NC	NC	NC	6
Ningaloo - Outer Coast North	1,169 (48 d, 17 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	145	NC	NC	NC	2
Ningaloo - Outer NW	1,159 (48 d, 7 hrs)	1,670 (69 d, 14 hrs)	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	463	NC	NC	NC	4
Ningaloo Coast North	1,184 (49 d, 8 hrs)	NC	NC	1,189 (49 d, 13 hrs)	1,193 (49 d, 17 hrs)	1,201 (50 d, 1 hrs)	2,854	1,030	1,012	518	214	160	33	NC	101	NC	NC	NC	<1
Ningaloo Coast South	NC	NC	NC	1,259 (52 d, 11 hrs)	NC	NC	59	2	NC	NC	7	NC	NC	NC	<1	NC	NC	NC	NC

Receptor Contacted	Min time for floating oil hours (days)			Min. time for shoreline accumulation hours (days)			Maximum local accumulated concentration (g/m ²)	Maximum local accumulated volume (m ³)			Maximum length of shoreline contacted (km)			Entrained minimum time to receptor waters hours (days)	Maximum entrained hydrocarbon concentration ppb	Dissolved minimum time to receptor waters hours (days)			Maximum dissolved hydrocarbon concentration ppb
	≥1 g/m ² †	≥10 g/m ²	≥50 g/m ²	≥10 g/m ² †	≥100 g/m ²	≥1,000 g/m ²		≥10 g/m ² †	≥100 g/m ²	≥1,000 g/m ²	≥10 g/m ² †	≥100 g/m ²	≥1,000 g/m ²			≥10 ppb†	≥50 ppb	≥400 ppb	
Northern Islands Coast	1,858 (77 d, 10 hrs)	NC	NC	1,251 (52 d, 3 hrs)	1,456 (60 d, 16 hrs)	NC	488	51	42	NC	44	17	NC	NC	<1	NC	NC	NC	NC
Rosily Shoals	1,713 (71 d, 9 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	<1	NC	NC	NC	NC
Scott Reef South	NC	NC	NC	1,745 (72 d, 17 hrs)	NC	NC	11	<1	NC	NC	1	NC	NC	NC	NC	NC	NC	NC	NC
Southern Islands Coast	1,224 (51 d, 0 hrs)	NC	NC	1,183 (49 d, 7 hrs)	1,185 (49 d, 9 hrs)	1,221 (50 d, 21 hrs)	1,408	282	257	22	136	73	2	NC	4	NC	NC	NC	<1
Thevenard Islands	1,644 (68 d, 12 hrs)	NC	NC	1,213 (50 d, 13 hrs)	1,233 (51 d, 9 hrs)	1,848 (77 d, 0 hrs)	1,068	42	42	11	14	14	1	NC	<1	NC	NC	NC	NC
WA State Waters*	1,183 (49 d, 7 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	101	NC	NC	NC	<1
Summary of EVAs exposed by the single surface LOWC simulation (summer, run 95), which resulted in the largest area of floating oil ≥50 g/m²																			
Gascoyne AMP	847 (35 d, 7 hrs)	NC	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	16	NC	NC	NC	<1
Muiron Islands	NC	NC	NC	1,775 (73 d, 23 hrs)	NC	NC	16	<1	NC	NC	1	NC	NC	NC	5	NC	NC	NC	<1
Ningaloo – Offshore^	476 (19 d, 20 hrs)	732 (30 d, 12 hrs)	1,705 (71 d, 1 hrs)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,023 (42 d, 15 hrs)	1,758	NC	NC	NC	5
Ningaloo - Outer NW	1,064 (44 d, 8 hrs)	1,794 (74 d, 18 hrs)	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	222	NC	NC	NC	2

NA: Not applicable for receptor.

NC: No contact to receptor predicted for specified threshold.

 Submerged receptor

 Intertidal receptor

^: EVA that the release location falls within.

*: This receptor is not an environmental value area defined by Santos.

† = low threshold to inform operational and scientific monitoring response and capability, presented in Section 17 and Appendix N.

6.4 Evaluation of Applicable Response Strategies

Based on the nature and scale of the credible spill scenarios outlined in Section 6.1 and spill modelling results (Section 6.3) the following spill response strategies have been assessed as potentially applicable for combatting an oil spill (Table 6-6).

Note, the information contained in Table 6-6 has been developed by Santos for preparedness purposes. Santos may not be the Control Agency or Lead IMT for implementing a spill response. For example, for Level 2/3 spills within or entering State waters, DTMI will ultimately determine the strategies and controls implemented for most State water activities with Santos providing resources and planning assistance.

Table 6-6: Evaluation of applicable response strategies

OSR Strategy	Tactic	Applicability and designated primary (1) or secondary (2) response strategy		Considerations
		LOWC (LWIV or Semi-submersible MODU) (Van Gogh Crude)	Vessel collision (MDO)	
Source Control	Shipboard oil pollution emergency plan (SOPEP)	N/A	✓1	<ul style="list-style-type: none"> MARPOL requirement for applicable vessels. In the event a vessel hydrocarbon storage tank is ruptured, applicable strategies for reducing the volume of hydrocarbon releases will be contained within the vessel SOPEP. This may include securing fuel via transfer to another storage area onboard the vessel, transfer to another vessel, or through pumping in water to affected tank to create a water cushion (tank water bottom). Trimming the vessel may also be used to avoid further damage to intact tanks. These actions will aim to minimise the volume of fuel spilled.
	Spill kits	N/A	✓1	<ul style="list-style-type: none"> Relevant for containing spills that may arise onboard a vessel.
	Secondary containment	N/A	✓1	<ul style="list-style-type: none"> Relevant for spills that may arise due to stored hydrocarbons, and from spills arising from machinery and equipment onboard a vessel. Bunded areas will contain hydrocarbons reducing the potential for a spill escaping to marine waters. Where applicable open deck drainage will be closed to prevent hydrocarbon draining into the marine environment.
	Blowout preventer – emergency activation	✓1	N/A	<ul style="list-style-type: none"> A blow-out preventer (BOP) stack will be installed prior to commencing the decommissioning activity using a MODU. The BOP provides a secondary barrier to hydrocarbons by providing a mechanical means of shutting in the well if primary well control is lost, and hydrocarbons enter the wellbore.
	Relief well drilling	✓1	N/A	<ul style="list-style-type: none"> Relief well drilling is the primary method for killing a blow-out well or well leak. To be conducted as per the Source Control Planning and Response Guideline (DR-00-OZ-20001).
	Capping stack	N/A	N/A	<ul style="list-style-type: none"> Not applicable if the well is suspended using a light well intervention vessel. Not suitable for well decommissioning given the LOWC release is at the surface.
	Subsea First Response Toolkit (SFRT)	N/A	N/A	<ul style="list-style-type: none"> Debris clearance equipment using the SFRT not anticipated to be required, as a capping stack or subsea dispersant would not be deployed for this scenario.
In-Situ Burning	Controlled burning of oil spill	x	x	<ul style="list-style-type: none"> LOWC is not expected to result in a suitable thickness on the surface of Van Gogh crude to allow for ignition and burning; Un-emulsified oil requires a slick thickness of 2–3 mm to initiate and sustain burning (Federici & Mintz, 2014).

OSR Strategy	Tactic	Applicability and designated primary (1) or secondary (2) response strategy		Considerations
		LOWC (LWIV or Semi-submersible MODU) (Van Gogh Crude)	Vessel collision (MDO)	
				<ul style="list-style-type: none"> In-situ burning is not normally considered as an acceptable response strategy due to the atmospheric emissions created.
Monitor and Evaluate	Vessel surveillance	✓1	✓1	<ul style="list-style-type: none"> Provides real-time information on spill trajectory and behaviour (e.g. weathering). Informs implementation of other response strategies. Vessel personnel may not be trained observers. Vessel observers on leaking vessel may not have capacity to observe oil during emergency response procedure implementation. Constrained to daylight.
	Aerial surveillance	✓1	✓1	<ul style="list-style-type: none"> Provides real-time information on spill trajectory and behaviour (e.g. weathering). May identify environmental sensitivities impacted or at risk of impact (e.g. seabird aggregations, other users such as fishers). Informs implementation of other response strategies.
	Tracking buoys	✓1	✓1	<ul style="list-style-type: none"> Can be implemented rapidly. Can provide indication of near-surface entrained/dissolved hydrocarbons (most other monitor and evaluate techniques rely on the hydrocarbon being on the surface or shoreline).
	Trajectory Modelling	✓1	✓1	<ul style="list-style-type: none"> Can be implemented rapidly. Predictive – provides estimate of where the oil may go, which can be used to prepare and implement other responses. No additional field personnel required. Not constrained by weather conditions. Can predict floating, entrained, dissolved and stranded hydrocarbon fractions. May not be 100% accurate. Requires in-field calibration.
	Satellite Imagery	✓1	✓1	<ul style="list-style-type: none"> Can work under large range of weather conditions (e.g. night-time, cloud cover, etc.). Mobilisation restricted to image availability. Requires processing. May return false positives.

OSR Strategy	Tactic	Applicability and designated primary (1) or secondary (2) response strategy		Considerations
		LOWC (LWIV or Semi-submersible MODU) (Van Gogh Crude)	Vessel collision (MDO)	
Subsea dispersant injection (SSDI)	Subsea Dispersant Injection (SSDI)	N/A	N/A	<ul style="list-style-type: none"> SSDI is only suitable for subsea LOWC scenarios.
Surface Chemical Dispersion	Surface dispersant: vessel application	✓1	x	<ul style="list-style-type: none"> Surface chemical dispersants are most effective on hydrocarbons that are at a thickness of 50–100 g/m² on the sea surface. EMSA (2010) recommends thin layers of spilled hydrocarbons should not be treated with dispersant. <p>MDO</p> <ul style="list-style-type: none"> MDO contains low levels of persistent hydrocarbons and has high natural spreading, dispersion and evaporation rates in the marine environment. Dispersant use is not advised on light distillate fuels such as MDO as these oils will evaporate and naturally disperse quite rapidly under most conditions (IPIECA-IOGP 2016a). Therefore, considering the rapid evaporation rates of MDO and the tendency to naturally disperse, the addition of chemical dispersants would have little to no net environmental benefit whilst potentially increasing localised toxicity in the water column. <p>Van Gogh Crude</p> <ul style="list-style-type: none"> Spill modelling of the LOWC scenario predicted that slicks ≥50 µm, which is typically considered the lowest practical threshold for effective surface dispersant application, would extend only up to around 3 km from the release location. The limited areal extent of thick slicks means that dispersant application would be targeted close to the well site, but modelling indicates that surface slicks within this zone may be of sufficient thickness to support effective dispersant application. Accordingly, surface dispersant application is identified as a primary response strategy for the LOWC scenario involving Van Gogh crude.
	Surface dispersant: aerial application	✓1	x	
Offshore Containment and Recovery	Use of offshore booms/ skimmers or other collection techniques deployed from vessel/s to contain and collect oil.	✓1	x	<p>MDO</p> <ul style="list-style-type: none"> Containment and recovery is not suitable for MDO given its rapid weathering nature and strong tendency to entrain into the upper water column in the presence of moderate winds (i.e. >10 knots). MDO will evaporate and spread quickly to a thin film, making recovery via skimmers difficult and ineffective. <p>Van Gogh Crude</p> <ul style="list-style-type: none"> Spill modelling of the LOWC scenario predicted that slicks ≥50 µm (which is typically considered the lowest threshold for effective containment and recovery), may only extend for up to 3 km from the release location. The limited spatial extent of these thicker slicks means offshore containment and

OSR Strategy	Tactic	Applicability and designated primary (1) or secondary (2) response strategy		Considerations
		LOWC (LWIV or Semi-submersible MODU) (Van Gogh Crude)	Vessel collision (MDO)	
				recovery would be targeted very close to the well site. However, modelling indicates that slicks within this zone may be of sufficient thickness to support effective containment and recovery. Accordingly, offshore containment and recovery is identified as a primary response strategy for the LOWC scenario involving Van Gogh crude.
Mechanical Dispersion	Vessel prop-washing	✓2	✓2	<ul style="list-style-type: none"> • Safety is a key factor and slicks with potential for high volatile organic compound (VOC) emission may not suitable. • Mechanical dispersion may be applicable for the localised entrainment of surface oil but is not considered to have a significant effect on removing oil from the surface. • Mechanical dispersion will entrain surface oil into the top layer of the water column. The aim of mechanical dispersion is to reduce the concentration of oil floating at the surface which could potentially contact receptors at the sea surface (e.g. sea birds) or shoreline receptors (e.g. mangroves). Once dispersed in the water column the smaller droplet sizes enhance the biodegradation process. • MDO can be easily dispersed in the water column by running vessels through the plume and using the turbulence developed by the propellers to break up the slick. • Mechanical dispersion may be considered for targeted small breakaway patches of crude but may have limited effectiveness. • The potential disadvantage of mechanical dispersion is that it could temporarily increase the concentration of entrained and dissolved oil in the vicinity of submerged shallow water receptors (e.g. corals, seagrass and macroalgae). This is most likely in shallow water of a few metres deep. The suitability of mechanical dispersion as a response measure would consider the prevailing environmental conditions (it mimics the action of wave induced entrainment so is most beneficial in calm conditions) and the type, proximity and depth (as applicable) of sensitivities in the area. • Mechanical dispersion will be considered at the discretion of the OSC/IMT or by the relevant Control Agency. It is unlikely that vessels would be specifically allocated for mechanical dispersion but support vessels in the field undertaking primary strategies may be used opportunistically.
Protection and Deflection	Booming in nearshore waters and at shorelines	✓2	N/A	<ul style="list-style-type: none"> • Considered if monitor and evaluate shows or predicts contact with sensitive shorelines. • Shoreline protection and deflection activities can result in physical disturbance to intertidal and shoreline habitats.

OSR Strategy	Tactic	Applicability and designated primary (1) or secondary (2) response strategy		Considerations
		LOWC (LWIV or Semi-submersible MODU) (Van Gogh Crude)	Vessel collision (MDO)	
				<p>MDO</p> <ul style="list-style-type: none"> Modelling predicts no probability of floating oil contact, or shoreline accumulation for any emergent receptor at or above any threshold. <p>Van Gogh Crude</p> <ul style="list-style-type: none"> In the worst-case stochastic scenario, modelling predicts no floating oil contact at the higher floating oil threshold (≥ 50 g/m²). However, the modelling shows potential for shoreline accumulation of Van Gogh crude, with the highest predicted accumulation occurring along the Ningaloo Coast North receptor at up to 1,012 m³ of oil (at ≥ 100 g/m²). Therefore, shoreline protection and deflection is identified as a secondary response strategy to prevent or minimise shoreline contact.
Shoreline Clean Up	Activities include physical removal, surf washing, flushing, bioremediation, natural dispersion	✓1	N/A	<ul style="list-style-type: none"> Intrusive activities such as physical removal of waste using manual labour or mechanical aids requires careful site-specific planning to reduce secondary impacts of habitat disturbance, erosion and spreading oil beyond shorelines. Secondary impacts can be minimised through the use of trained personnel to lead operations. Logistically, clean-up operations will require site access, decontamination, waste storage, personal protective equipment, catering and transport services to support personnel working on shorelines. Flushing may be considered if the oil enters high priority/slow recovery habitats such as mangroves. Natural dispersion will occur as the hydrocarbon is remobilised from rock shelves and hard substrates, while residual hydrocarbons will biodegrade over time. <p>MDO</p> <ul style="list-style-type: none"> Modelling predicts no probability of floating oil contact or shoreline accumulation for any emergent receptor at or above any threshold. <p>Van Gogh Crude</p> <ul style="list-style-type: none"> In the worst-case stochastic scenario, modelling predicts shoreline accumulation at the ≥ 100 g/m² threshold for multiple receptors, with a worst-case volume ashore of 1,012 m³ at Ningaloo Coast North, resulting in up to 160 km of shoreline impacted. Shoreline clean-up is therefore considered a primary response strategy for Van Gogh crude.
Oiled wildlife response	Activities include hazing, pre-emptive capture, oiled wildlife capture, cleaning and rehabilitation	✓1	✓1	<ul style="list-style-type: none"> Can be used to deter and protect wildlife from contact with oil. Mainly applicable for marine and coastal fauna (e.g. birds) where oil is present at the sea surface or accumulated at coastlines. Surveillance can be carried out as a part of the fauna specific operational monitoring.

OSR Strategy	Tactic	Applicability and designated primary (1) or secondary (2) response strategy		Considerations
		LOWC (LWIV or Semi-submersible MODU) (Van Gogh Crude)	Vessel collision (MDO)	
				<ul style="list-style-type: none"> Wildlife may become desensitised to hazing method. Hazing may impact upon animals (e.g. stress, disturb important behaviours such as nesting or foraging). Permitting requirements for hazing and pre-emptive capture.
Operational and Scientific Monitoring	The monitoring of the effectiveness and potential impacts of response strategies; and the monitoring of environmental receptors to determine the level of impact from the oil spill and associated response activities that is sufficient to inform any remediation activities	✓1	✓1	<ul style="list-style-type: none"> Operational monitoring activities include: <ul style="list-style-type: none"> hydrocarbon properties and weathering behaviour water and sediment quality assessment chemical dispersant effectiveness and fate assessment rapid marine fauna surveillance shoreline clean-up assessment Scientific monitoring activities include: <ul style="list-style-type: none"> water and sediment quality biota of shorelines (sandy beaches, rocky shores and intertidal mudflats) mangrove monitoring benthic habitat monitoring (seagrass, algae, corals, non-coral benthic filter feeders) seabirds and shorebirds marine megafauna (incl. whale sharks and mammals) marine reptiles (incl. turtles) seafood quality fish, fisheries and aquaculture The type and extent of operational and scientific monitoring will depend upon the nature and scale of oil contact to sensitive receptor locations. Pre-defined initiation criteria exist for operational and scientific monitoring plans.

6.5 Identification of Priority Protection Areas and Initial Response Priorities

Prioritising receptors helps identify where available resources (for response and/or monitoring) should be directed for the best effect. It enables the control agency to make informed decisions, and ultimately in the development and execution of an effective response strategy.

Combined spill modelling results were used to predict the Environment that May be Affected (EMBA) for the VGA-4H GI ST1 well suspension / decommissioning activities (refer to Section 3.1 of the VGA-4H GI ST1 Well Decommissioning EP ([7745-236-EMP-0001])). The EMBA is the largest area within which effects from hydrocarbon spills associated with this activity, could extend. Within the EMBA, priority protection areas (PPAs) have been identified. PPAs are emergent features (i.e. coastal areas and islands) that are predicted to be contacted above moderate exposure values at greater than 5% probability and would be targeted by nearshore spill response operations such as protection and deflection and shoreline clean-up. Sections 7.5.5.3 and 7.5.5.4 of the VGA-4H GI ST1 Well Decommissioning EP ([7745-236-EMP-0001])) describes the basis for determining hot spots and PPAs. These are further described in EP Sections 7.6 and 7.7 for the LOWC and MDO spill scenarios respectively.

Table 6-7 shows the rationale for the hotspots that were selected as PPAs from the list of contacted receptors from the surface MDO and LOWC release scenarios.

The HEV ranking of these receptors are consistent with the rankings in the Provision of Western Australian Marine Oil Pollution Risk Assessment – Protection Priorities: Assessment for Zone 2: Pilbara (Advisian 2017). Using a combination of sensitivities, and their associated rankings; together with the modelled maximum total volumes ashore and minimum time to shoreline contact, an initial response priority is provided in Table 6-8. This information is designed to aid decision making in the preliminary stages of the response operation, so that initial resources are used for best effect.

Note, the PPAs for response also correspond with the wildlife priority protection areas presented in Section 16.2 with further detail on the species that may be present and key locations provided in Table 16-3.

Table 6-7: Determination and rationale for the protection priority areas

Receptor	HEV Ranking	Hotspot	PPA	PPA Selection Rationale
Barrow Island	3	Y	Y	HEV=3 with probability >5% for shoreline accumulation (≥ 100 g/m ²) from day 29. Maximum volume (m ³) of accumulated oil ashore at ≥ 100 g/m ² for a single simulation = 343 m ³ .
Lowendal Islands	3	Y	Y	HEV=3 with probability >5% for shoreline accumulation (≥ 100 g/m ²) from day 31. Maximum volume (m ³) of accumulated oil ashore at ≥ 100 g/m ² for a single simulation = 30 m ³ .
Montebello Islands	3	Y	Y	HEV=3 with probability >5% for shoreline accumulation (≥ 100 g/m ²) from day 30. Maximum volume (m ³) of accumulated oil ashore at ≥ 100 g/m ² for a single simulation = 241 m ³ .
Muiron Islands	2	Y	Y	HEV=2 with probability > 5% for shoreline accumulation (≥ 100 g/m ²) from day 31. Maximum volume (m ³) of accumulated oil ashore at ≥ 100 g/m ² for a single simulation = 100 m ³ .
Ningaloo – Offshore	2	Y	N	Submerged receptor.
Ningaloo - Outer NW	3	Y	N	Submerged receptor.
Ningaloo Coast North	1	Y	Y	HEV=1 with probability >5% for shoreline accumulation (≥ 100 g/m ²) from day 23. Low probability (<5%) for floating oil (10 g/m ²) from day 42. Maximum volume (m ³) of accumulated oil ashore at ≥ 100 g/m ² for a single simulation = 1,012 m ³ .
Northern Islands Coast	3	Y	Y	HEV=3 with probability >5% for shoreline accumulation (≥ 100 g/m ²) from day 31. Maximum volume (m ³) of accumulated oil ashore at ≥ 100 g/m ² for a single simulation = 79 m ³ .

Receptor	HEV Ranking	Hotspot	PPA	PPA Selection Rationale
Southern Islands Coast	4	Y	N	HEV=4 with probability > 5% for shoreline accumulation ($\geq 100 \text{ g/m}^2$) from day 32. Maximum volume (m^3) of accumulated oil ashore at $\geq 100 \text{ g/m}^2$ for a single simulation = 631 m^3 .
Thevenard Islands	4	Y	N	HEV=4 with probability > 5% for shoreline accumulation ($\geq 100 \text{ g/m}^2$) from day 37. Maximum volume (m^3) of accumulated oil ashore at $\geq 100 \text{ g/m}^2$ for a single simulation = 42 m^3 .

 = Submerged receptor

Table 6-8: Initial response priorities for VGA-4H GI ST1 Well Suspension / Decommissioning activities

Protection Priority Area	Key Sensitivities	DTMI Ranking (Floating Oil)	DTMI Ranking (Dissolved Oil)	Key Locations	Relevant key Periods	Peak volume ashore ≥ 100 g/m ² (m ³)	Min. arrival time accumulated oil ashore ≥ 100 g/m ² (hours)	Initial response priority
Barrow Island	Mangroves	3	3	Bandicoot Bay	N/A	343 (Van Gogh Crude) MDO: no contact	700 (29 days 4 hours) (Van Gogh Crude)	Medium
	Turtles Regionally and nationally significant green turtle (<i>Chelonia mydas</i>), flatback turtle (<i>Natator depressus</i>), loggerhead turtle (<i>Caretta caretta</i>) and hawksbill turtle (<i>Eretmochelys imbricata</i>)	4	3	Western side of Barrow Island (green turtles) Eastern side of Barrow Island (flatback turtles) Turtle Bay north beach, north and west coasts and John Wayne Beach (loggerhead and hawksbill turtle nesting)	Nesting year round, peak Oct–Jan			High
	<u>Birds</u> Migratory birds (important habitat); 10 th of top 147 bird sites, Highest population of migratory birds on Barrow Island Nature Reserve (south-south-east of the Island), Double Island has important bird nesting habitat (shearwaters [<i>Puffinus sp.</i>], sea eagles [<i>Haliaeetus sp.</i>])	2	1	Double Islands – migratory birds Bandicoot Bay and widespread on Barrow Island – migratory birds	Nesting: Sep–Feb			Low
	Coral and other subsea benthic primary producers	3	4	Eastern side – Biggada Reef	Coral spawning: Mar and Oct			Medium
	<u>Socio-economic</u> Significant for recreational fishing and charter boat tourism, Nominated place (National heritage), Industry – Reverse Osmosis Plant and port operations	5	5	Reverse Osmosis plant and port on eastern side of island (Port of Barrow Island)	N/A			Medium

Protection Priority Area	Key Sensitivities	DTMI Ranking (Floating Oil)	DTMI Ranking (Dissolved Oil)	Key Locations	Relevant key Periods	Peak volume ashore ≥ 100 g/m ² (m ³)	Min. arrival time accumulated oil ashore ≥ 100 g/m ² (hours)	Initial response priority
	Petroleum Activities such as Barrow Island petroleum production							
Lowendal Islands	Mangroves	3	3	Varanus Island, Bridled Island	N/A	30 (Van Gogh Crude) MDO: no contact	749 (31 days, 5 hours 30)	Low
	Coral and other subsea benthic primary producers	3	4	Deep-water benthic (soft sediment) habitats Dugong Reef and Batman Reef (eastern side of Island)	Coral spawning: Mar and Oct			Medium
	Turtles Significant flatback turtle rookery, Important hawksbill, loggerhead and green turtle nesting	4	3	All beaches on Beacon, Bridled, Varanus, Abutilon, Parakeelya Islands	Nesting all year, peak Oct to Jan Significant flatback rookery, nesting season for flatback turtles peaks Dec to Jan			Low
	Birds Approximately 89 species of avifauna, 12 to 14 migratory and threatened seabirds Seabirds nesting: wedge-tailed shearwater (<i>Ardenna pacifica</i>), bridled tern (<i>Onychoprion anaethetus</i>), crested tern (<i>Thalasseus bergii</i>), lesser crested tern (<i>T. bengalensis</i>) and silver gull (<i>Chroicocephalus novaehollandiae</i>) Regularly supports 1% of the world population of crested and bridled terns	2	1	Abutilon, Beacon, Bridled, Parakeelya, Varanus islands	Year-round			Low
	Marine mammals Dugong foraging	3	2	Seagrass beds	N/A			Medium

Protection Priority Area	Key Sensitivities	DTMI Ranking (Floating Oil)	DTMI Ranking (Dissolved Oil)	Key Locations	Relevant key Periods	Peak volume ashore ≥ 100 g/m ² (m ³)	Min. arrival time accumulated oil ashore ≥ 100 g/m ² (hours)	Initial response priority
	Socio-economic and heritage Social amenities and other tourism, very significant for recreational fishing and charter boat tourism	2	2	Widespread	N/A			Low
Muiron Islands	<u>Turtles</u> Turtle nesting – major loggerhead (<i>Caretta caretta</i>) site, significant green turtle (<i>Chelonia mydas</i>) nesting site, low density hawksbill nesting (<i>Eretmochelys imbricata</i>), occasional flatback (<i>Natator depressus</i>) presence	4	3	Loggerhead – South Island	Turtle nesting and breeding Nov to Mar with peak in late Dec/early Jan	96 (Van Gogh Crude) MDO: no contact	747 (31 days, 3 hours)	High
	Coral and other subsea benthic primary producers	3	4	N/A	Coral spawning Mar & Oct	Medium		
	Seabird nesting	2	1	Widespread	Nesting: Sep–Feb	Low		
	Humpback whale migration	3	2	N/A	Peak between June –Aug	Medium		
	Exmouth gulf prawn fishery (Muiron is western boundary); significant for recreational fishing and charter boat tourism	1	2		Prawn fishery – April to November	Low		
Montebello Islands	Mangroves	3	3	Widespread and present in lagoons. Important stands in Stephenson Channel	N/A	241 (Van Gogh Crude)	738 (30 days, 18 hours)	Medium
	Turtles	4	3	Northwest and Eastern Trimouille Islands (hawksbill)	Turtle nesting and breeding Nov to Mar with peak in late Dec/early Jan			Medium

Protection Priority Area	Key Sensitivities	DTMI Ranking (Floating Oil)	DTMI Ranking (Dissolved Oil)	Key Locations	Relevant key Periods	Peak volume ashore ≥ 100 g/m ² (m ³)	Min. arrival time accumulated oil ashore ≥ 100 g/m ² (hours)	Initial response priority
	Loggerhead and green (significant rookeries); hawksbill, flatback turtles			Western Reef and Southern Bay at Northwest Island (green)		MDO: no contact		
	Marine mammals Pygmy blue whale and humpback whale migration area Dugong foraging	3	2	N/A	Pygmy blue whale migration: Apr to Aug Humpback whale migration: Jun to Aug			Medium
	Birds Migratory and threatened seabirds – at least 14 species Significant nesting, foraging and resting areas	3	2	Widespread	Nesting: Sep to Feb			Low
	Coral and other subsea benthic primary producers	3	4	Widespread	Coral spawning: Mar & Oct			Medium
Ningaloo Coast North	World Heritage Area	5	5	N/A	N/A	1,012 (Van Gogh Crude)	565 (23 days, 13 hours)	High
	Mangroves	3	3	Mangrove Bay Yardie Creek	N/A			High
	<u>Turtles</u> Loggerhead (<i>Caretta caretta</i>), green (<i>Chelonia mydas</i>), hawksbill (<i>Eretmochelys imbricata</i>) (low density)	4	3	North Mauds Landing, south of Point Cloates, Mandu Creek to Yardie Creek, Jurabi Point, Gnarraloo Bay and Cape Farquhar	Turtle nesting and breeding Nov to Mar with peak in late Dec/early Jan	MDO: no contact		High
	<u>Marine mammals</u> Pygmy blue whales (<i>Balaenoptera musculus brevicauda</i>) foraging area. Dugongs (<i>Dugong dugon</i>) Marine/migratory, breeding and foraging	3	2	N/A	Pygmy blue whale migration: Apr to Aug Humpback whale migration: Jun to Jul			Medium

Protection Priority Area	Key Sensitivities	DTMI Ranking (Floating Oil)	DTMI Ranking (Dissolved Oil)	Key Locations	Relevant key Periods	Peak volume ashore ≥ 100 g/m ² (m ³)	Min. arrival time accumulated oil ashore ≥ 100 g/m ² (hours)	Initial response priority
	<u>Sharks and rays</u> Seasonal aggregations of whale sharks (<i>Rhincodon typus</i>) and manta rays	2	3	N/A	Whale sharks – Mar to Jul			Medium
	<u>Birds</u> 33 species seabirds and avifauna (Including Eastern Curlew; <i>Numenius madagascariensis</i>)	5	4	Main breeding areas at Mangrove Bay, Mangrove Point, Point Maud, the Mildura wreck site and Fraser Island	Nesting: Sep to Feb			High
	Coral and other subsea benthic primary producers	3	4	Largest fringing reef in Australia	Coral spawning: Mar & Oct			High
	Tourism – significant fishing/charter boat tourism, camping and use of nearshore sanctuary zones (fishing, snorkelling)	2	2	Numerous campsites and snorkelling sites along western Cape Range shorelines, Coral Bay, Waroora Station	Year-round			Medium
Northern Islands Coast	Mangroves	3	3	Widespread	N/A	79 (Van Gogh Crude) MDO: no contact	761 (31 days, 17 hours)	Medium
	<u>Turtles</u> Hawksbill; significant rookery, Loggerhead, green, flatback turtles	4	3	Sholl Island (Hawksbill)	Turtle nesting and breeding Nov to Mar with peak in late Dec/early Jan			High
	<u>Marine mammals</u> Humpback whale migration area Dugong foraging	3	2	N/A	Humpback whale migration: Jun to Aug			Medium
	<u>Birds</u> Migratory and threatened seabirds – at least 24 species Significant nesting, foraging and resting areas	3	2	Widespread	Nesting: Sep to Feb			Low

Protection Priority Area	Key Sensitivities	DTMI Ranking (Floating Oil)	DTMI Ranking (Dissolved Oil)	Key Locations	Relevant key Periods	Peak volume ashore $\geq 100 \text{ g/m}^2 \text{ (m}^3\text{)}$	Min. arrival time accumulated oil ashore $\geq 100 \text{ g/m}^2 \text{ (hours)}$	Initial response priority
	Coral and other subsea benthic primary producers	3	4	Widespread	Coral spawning: Mar & Oct			Medium
	Tourism – significant fishing/charter boat tourism, camping	1	1	Widespread	Year-round			Low

6.5.1 Tactical response plans for priority protection areas

Santos' Tactical Response Plans (TRPs) are in place for the PPA's (Table 6-9), identifying suitable response strategies, equipment requirements, relevant environmental information, and access and permit requirements. TRPs are to be used by the IMT for first strike and ongoing activities and to assist in informing the appropriate responses for inclusion in an IAP.

Not all PPA's require TRPs in place. The requirement for a TRP considers the hydrocarbon type and predicted time to contact to a PPA from accumulated or floating hydrocarbons in <10 days (above the response planning thresholds defined in Section 6.2). Ten days allows two days to get services procured; six days to draft the TRP; and two days to finalise and issue for use. The Sensitivity Ranking (HEV and DTMI), and accessibility (i.e. on mainland compared to a remote island location) are also considered. A TRP will also be considered should the impact from hydrocarbons be considerable (high accumulation, large floating oil contact). Although the predicted contact times for all PPAs are >10 days, existing TRPs for the identified PPAs have been included as detailed in Table 6-9. Santos also has access to the INPEX Browse Regional OPEP – Area Response Planning Guideline (document no. X060-AH-GLN-70005) via a collaborative agreement, which provides additional guidance for response at Clerke Reef and Imperieuse Reef within its Rowley Shoals Area Response Plan (Appendix A.6).

Where TRPs are unavailable for areas likely to be contacted, refer to other sources of information such as aerial photography, Oil Spill Response Atlas, Pilbara Region Oiled Wildlife Response Plan and the DTMI [Western Australia Marine Oil Pollution Risk Assessment \(WAMOPRA\)](#). Additionally, TRPs for contacted receptors will be sought from other titleholders where possible.

Table 6-9: Tactical response plans for priority protection areas

PPA	TRP Evaluation	Existing TRP
Barrow Island	<ul style="list-style-type: none"> • NWS OSCP Volume 2: Environmental Resource Atlas- Barrow is covered • Chevron Australia TRPs for Barrow Island (Santos has an agreement with Chevron for use of these TRPs): <ul style="list-style-type: none"> – Wapet Landing – Double Islands – Mushroom Beach – Terminal Beach – MOF Basin and Seawater Intakes – Bivalve Beach – Inga Beach – Yacht Club – Little Bandicoot Bay – Turtle Bay – Whites Beach 	Yes
Lowendal Islands	<ul style="list-style-type: none"> • Existing TRP in place for Lowendal Islands Group: <ul style="list-style-type: none"> – Varanus Island – Bridled Island – Abutilon Island 	Yes
Muiron Islands	Existing TRP in place for Muiron Islands	Yes
Montebello Islands	Existing TRPs in place for: <ul style="list-style-type: none"> • Montebello 1: Claret Bay • Montebello 2: Sherry Lagoon entrance • Montebello 3: Hock Bay • Montebello 4: Stephenson Channel, north • Montebello 5: Hermite – Delta Island channel • Montebello 6: Champagne Bay – Chippendal Channel • Montebello 7: North Channel and Kelvin Channel 	Yes
Ningaloo Coast North	Existing TRPs in place for: <ul style="list-style-type: none"> – Wapet Landing – Jurabi to Lighthouse Bay beaches – Mangrove Bay 	Yes

PPA	TRP Evaluation	Existing TRP
	<ul style="list-style-type: none"> - Muiron Islands - Turquoise Bay - Yardie Creek 	

6.6 Net Environmental Benefit Analysis

The IMT uses a NEBA, also referred to as a spill impact mitigation assessment (SIMA), to inform the incident action planning process (Section 8), so the most effective response strategies with the least detrimental environmental impacts can be identified, documented and executed.

Within Santos’s IMT, the Environment Unit Leader is responsible for reviewing the priority receptors identified within the EP and this OPEP and coordinating the Operational NEBA to identify and prioritise initial response priorities and apply the NEBA to identify which response strategies are preferred for the situation, oil type and behaviour, environmental conditions, direction of plume and priorities for protection.

As a component of the incident action planning process, a NEBA is conducted by the Control Agency with responsibility for the spill response activity. Where there are different activities controlled by different IMTs, as in a cross-jurisdictional response between Santos and WA DTMI, consultation will be required during the NEBA process such that there is consistency in the sensitivities prioritised for response across the Control Agencies.

A strategic NEBA has been developed for all response strategies identified as applicable to the spill scenarios, with the benefit or potential impact to each sensitivity identified (refer to Table 6-10 and Table 6-11).

In the event of a spill, a NEBA is applied with supporting information collected as part of the Monitor and Evaluate Plan (Section 10) to achieve the following:

- Identify sensitivities within the area potentially affected by a spill at that time of the year (noting that the sensitivity of some key receptors, such as birdlife and turtles, varies seasonally).
- Assist in prioritising and allocating resources to sensitivities with a higher protection and response priority (Table 6-8).
- Assist in determining appropriate response strategies with support of real-time metocean conditions, oil spill tracking and fate modelling.

When a spill occurs, a NEBA is applied to the current situation, or operationalised. Operational NEBA Templates are filed within the Environment Unit Leader folder on the Santos ER Intranet site. To complete the Operational NEBA:

- All ecological and socioeconomic sensitivities identified within the spill trajectory area are recorded.
- Potential effects of response strategies on each sensitivity are assessed in terms of their benefit or otherwise to the socio-economic sensitivities.
- All persons involved and data inputs have been considered for the analysis.

The Operational NEBA Form documents the decisions behind the recommendation to the Incident Commander on which resources at risk to prioritise, and the positives and negatives of response strategies to deploy. The Operational NEBA provides guidance to the IAPs and is revisited each Operational Period.

Table 6-10: Strategic net environmental benefit analysis matrix for LOWC (Van Gogh Crude) during VGA-4H GI ST1 Well Suspension / Decommissioning activities

Priority for Protection Area	No Controls	Source Control	Monitor and Evaluate	Containment and Recovery	Mechanical Dispersion	Surface Dispersant	Shoreline Protection & Deflection	Shoreline Clean-Up	Oiled Wildlife Response	Scientific Monitoring
Barrow Island										
Turtle nesting – particularly flatback (western side) and green turtles (eastern side)										
Mangroves and mudflats (shorebird foraging) – Bandicoot Bay									N/A	
Coral and other subsea benthic primary producers – incl. Biggada Reef							N/A	N/A	N/A	
Seabird nesting – incl. Double Island										
Migratory shorebirds – particularly Bandicoot Bay										
Aboriginal listed sites incl. pearling camps										
Lowendal Islands										
Turtles nesting- Important hawksbill (Beacon, Parakeelya, Kaia and Pipeline), Loggerhead and green turtle nesting (minor) Varanus										

Priority for Protection Area	No Controls	Source Control	Monitor and Evaluate	Containment and Recovery	Mechanical Dispersion	Surface Dispersant	Shoreline Protection & Deflection	Shoreline Clean-Up	Oiled Wildlife Response	Scientific Monitoring
pipeline, Harriet and Andersons),										
Mangroves- mangrove stands on Varanus Island on the west coast in discrete patches at South Mangrove Beach also on Bridled Island									N/A	
Coral and other subsea benthic primary producers							N/A	N/A	N/A	
Wedge-tailed shearwaters: Burrow excavation Egg laying Chick hatching Chick fledging										
Crested terns										
Bridled terns Egg laying Chick hatching										
Migratory shorebirds										
Dugongs- Seagrass beds around the Lowendal islands thought to provide valuable food source							N/A	N/A		
Humpback whale migration							N/A	N/A		
Aboriginal listed sites incl. pearling camps									N/A	N/A

Priority for Protection Area	No Controls	Source Control	Monitor and Evaluate	Containment and Recovery	Mechanical Dispersion	Surface Dispersant	Shoreline Protection & Deflection	Shoreline Clean-Up	Oiled Wildlife Response	Scientific Monitoring
Montebello Islands										
Turtle nesting – Northwest and Eastern Trimouille Islands (hawksbills), Western Reef and Southern Bay and Northwest Island (green)										
Mangroves – particularly Stephenson Channel									N/A	
Coral and other subsea benthic primary producers							N/A	N/A	N/A	
Seabird nesting										
Migratory shorebirds										
Humpback/ Pygmy blue whale migration							N/A	N/A		
Socio-economic – pearling, fishing, tourism and national heritage										
Muiron Islands										
Turtle nesting – major loggerhead site, significant Green turtle nesting site										
Coral and other subsea benthic primary producers							N/A	N/A	N/A	
Seabird nesting										

Priority for Protection Area	No Controls	Source Control	Monitor and Evaluate	Containment and Recovery	Mechanical Dispersion	Surface Dispersant	Shoreline Protection & Deflection	Shoreline Clean-Up	Oiled Wildlife Response	Scientific Monitoring
Humpback whale migration							N/A	N/A		
Tourism – significant fishing/charter boat tourism										
Ningaloo Coast North										
World Heritage Area										
Mangroves (Mangrove Bay, Yardie Creek)									N/A	
Turtle nesting and breeding sites loggerhead, green and hawksbill turtles										
Pygmy blue whale foraging area. Dugongs breeding and foraging area										
Whale shark and manta ray aggregations										
Seabird nesting										
Coral and other subsea benthic primary producers							N/A	N/A	N/A	
Tourism – significant fishing/charter boat tourism, camping and use of nearshore sanctuary zones (fishing, snorkelling)										

Priority for Protection Area	No Controls	Source Control	Monitor and Evaluate	Containment and Recovery	Mechanical Dispersion	Surface Dispersant	Shoreline Protection & Deflection	Shoreline Clean-Up	Oiled Wildlife Response	Scientific Monitoring
Northern Islands Coast										
Turtles nesting- Important hawksbill (Sholl Island). Green, loggerhead and flatback nesting										
Mangroves									N/A	
Coral and other subsea benthic primary producers							N/A	N/A	N/A	
Seabird nesting										
Migratory shorebirds										
Dugongs- Seagrass beds thought to provide valuable food source							N/A	N/A		
Humpback whale migration							N/A	N/A		
Tourism – significant fishing/charter boat tourism, camping										
	Beneficial impact									
	Possible beneficial impact dependent upon the situation (e.g. Timeframes and metocean conditions)									
	Negative impact									
N/A	Not applicable for the environmental value									

Table 6-11: Strategic net environmental benefit analysis – vessel MDO release

Priority for Protection Area	No Controls	Source Control	Monitor and Evaluate	Containment and Recovery	Mechanical Dispersion	Surface Dispersant	Shoreline Protection & Deflection	Shoreline Clean-Up	Oiled Wildlife Response	Scientific Monitoring
<u>Birds</u> Breeding BIAs for the Wedge-tailed shearwater Migratory seabirds and shorebirds				N/A		N/A	N/A	N/A		
<u>Reptiles</u> Reproduction (internesting) BIA for flatback turtles. Several other protected turtle species and sea snakes may be present.				N/A		N/A	N/A	N/A		
<u>Marine mammals</u> Pygmy blue whale migration BIA and humpback whale migration BIA. Several other protected whales, dolphins and dugongs may be present.				N/A		N/A	N/A	N/A		
<u>Fish, sharks and rays</u> Whale shark foraging BIA. Several protected sharks, sawfish and rays may be present.				N/A		N/A	N/A	N/A		
<u>Socio-economic</u> State and Commonwealth fisheries				N/A		N/A	N/A	N/A		
Legend										
	Beneficial impact									
	Possible beneficial impact depending on the situation (e.g. time frames and metocean conditions)									
	Negative impact									
N/A	Not applicable for the environmental value or not applicable for hydrocarbon type									

6.7 Oil Spill Response ALARP Assessment

For each response strategy included within this OPEP an environmental performance outcome has been determined, and key control measures and performance standards have been identified such that the response can meet the required performance outcome. For each response strategy, an ALARP assessment has been conducted to demonstrate that the control measures mitigate the risk of an oil spill to ALARP.

Appendix B details the ALARP assessment framework and the results of the ALARP assessment conducted to inform the control measures and performance standards contained within this OPEP.

7. External Notifications and Reporting Requirements

For oil spill incidents, the Emergency Commander / Vessel Master will notify the Perth-based IMT for delegation of further notifications to relevant regulatory authorities and stakeholders, and for further spill response assistance for Level 2/3 spills.

7.1 Regulatory Notification and Reporting

The Incident Commander (IC) is to delegate the following regulatory reporting requirements. The typical delegated party will be the Planning Section Chief.

Contact details for the regulatory agencies outlined in Table 7-1 are provided within the Incident Response Telephone Directory (7700-670-PLA-0016.20).

Table 7-1 outlines the external regulatory reporting requirements specifically for oil spill incidents outlined within this OPEP in Commonwealth and State jurisdictions, noting that regulatory reporting may apply to smaller Level 1 spills that can be responded to using on-site resources as well as larger Level 2/3 spills. There are also additional requirements for Vessel Masters to report oil spills from their vessels under relevant marine oil pollution legislation (e.g. MARPOL). This includes, where relevant, reporting oil spills to AMSA Rescue Coordination Centre (RCC) and WA DTMI (MEER Unit).

In the event of a Level 2 or 3 spill event, Santos will review the relevant persons identification process described in Section 4.2 of the VGA-4H GI ST1 Well Decommissioning EP [7745-236-EMP-0001] Relevant persons, whose functions, interests or activities that may be affected by the spill event or response arrangements will be identified and engaged in accordance with the Santos incident management process, noting notification and communications requests made by Relevant Persons during EP consultation with respect to emergency situations.

The Incident Response Telephone Directory (7700-670-PLA-0016.20) contains a more detailed list and contact information for ER support and is updated every six months with up-to-date revisions available within the IMT room and online (intranet procedures and ER pages).

7.2 Activation of External Oil Response Organisations and Support Agencies

Table 7-2 outlines notifications that should be made to supporting agencies to assist with spill response activities outlined within this plan. This list contains key OSROs that have pre-established roles in assisting Santos in an oil spill response. It is not an exhaustive list of all providers that Santos may use for assisting an oil spill response.

7.3 Environmental Performance

Table 7-3 lists the environmental performance outcome, control measures, performance standards and measurement criteria for external notifications and reporting.

Table 7-1: External notification and reporting requirements (Commonwealth and State waters)

Agency/Authority	Type of Notification/Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
NOPSEMA Reporting Requirements for Commonwealth Water Spills					
NOPSEMA (Incident Notification Office)	Verbal notification within two hours. Written report as soon as practicable, but no later than three days.	<i>Petroleum and Greenhouse Gas Storage Act 2006</i> OPGGS(E)R	A spill associated with the activity in Commonwealth waters that has the potential to cause moderate to significant environmental damage. ¹	Notification by Planning Section Chief (or delegate)	Incident reporting requirements: https://www.nopsema.gov.au/environmental-management/notification-and-reporting/
National Offshore Petroleum Titles Administrator (NOPTA) (Titles Administrator)	Written report to NOPTA within seven days of the initial report being submitted to NOPSEMA.	Guidance Note (N-03000-GN0926) Notification and Reporting of Environmental Incidents	Spill in Commonwealth waters that is reportable to NOPSEMA.	Notification by Planning Section Chief (or delegate)	Provide same written report as provided to NOPSEMA.
AMSA RCC ²	Verbal notification immediately following the event. Written POLREP form, within 24 hours on request from AMSA.	MARPOL	Santos to notify AMSA of any marine pollution incident. ¹	Notification by Planning Section Chief (or delegate)	https://www.amsa.gov.au/forms/harmful-substances-report-polrep-oil
Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEE) (Director of Monitoring and Audit Section)	Email notification as soon as practicable.	<i>Environment Protection and Biodiversity Conservation Act 1999</i>	If Matters of National Environmental Significance (MNES) are considered at risk from a spill or response strategy, or where there is death or injury to a protected species.	Notification by Planning Section Chief (or delegate)	Not applicable
Parks Australia (24-hour Marine Compliance Duty Officer)	Verbal notification as soon as practicable.	<i>Environment Protection and Biodiversity Conservation Act 1999</i>	An oil spill which occurs within a marine park or is likely to impact on an Australian Marine Park.	Notification by Planning Section Chief (or delegate)	Not applicable, but the following information should be provided: Titleholder's details. Time and location of the incident (including name of marine park likely to be affected). Proposed response arrangements as per the OPEP. Confirmation of providing access to relevant monitoring and evaluation reports when available.

Agency/Authority	Type of Notification/Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
					Details of the relevant contact person in the IMT.
Australian Fisheries Management Authority (AFMA)	Verbal phone call notification within 24 hours of incident.	For consistency with Department of Primary Industry and Regional Development (DPIRD) Fisheries notification	Reporting of marine oil pollution: ¹ Fisheries within the EMBA. Consider a courtesy call if not in exposure zone.	Notification by Planning Section Chief (or delegate)	Not applicable
If the Spill is Heading Towards WA Waters					
Department of Mines, Petroleum and Regulation (DMPE) (Petroleum Environment Duty Officer)	Verbal phone call within two hours of incident being identified. Follow up written notification within three days.	Regulations 28, 29 and 30 of the Petroleum (Submerged Lands) (Environment) Regulations 2012 Guidance Note on Environmental Non-compliance and Incident Reporting	All actual or impending spills in State waters.	Notification by Planning Section Chief (or delegate)	Environmental and Reportable Incident/Non-compliance Reporting Form: https://www.wa.gov.au/organisation/department-of-mines-petroleum-and-exploration/lodge-annual-environmental-report-notification-or-report-incident
WA DTMI ² (MEER Duty Officer)	Verbal notification within two hours. Follow up with Pollution Report (Appendix C) as soon as practicable after verbal notification. If requested, submit Situation Report (Appendix D) within 24 hours of request.	<i>Emergency Management Act 2005</i> SHP-MEE Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements	Santos to notify of actual or impending Marine Pollution Incidents (MOP) that are in, or may impact, State waters. Emergency Management Regulations 2006 define MOP as an actual or impending spillage, release or escape of oil or an oily mixture that is capable of causing loss of life or injury to a person or damage to the health of a person, property or the environment ¹ .	Notification by Planning Section Chief (or delegate) MEER Duty Officer (contacted per Incident Telephone Directory)	WA DTMI POLREP (Appendix C): https://www.transport.wa.gov.au/media/Files/marine/MAC-F-PollutionReport.pdf WA DTMI SITREP (Appendix D): https://www.transport.wa.gov.au/media/Files/marine/MAC-F-SituationReport.pdf
DBCA (State Duty Officer and Pilbara Regional Office)	Verbal notification as soon as reasonably practicable.	WAOWRP	Santos to notify DBCA of any marine pollution incident ¹ . Notify if spill has the potential to impact or has impacted wildlife in State	Notification by Planning Section Chief (or delegate)	Not applicable

Agency/Authority	Type of Notification/Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
			waters (to activate the OWA).		
WA Department of Primary Industry and Regional Development (DPIRD) Fisheries	Verbal phone call notification to DTMI Maritime Environmental Emergencies phone line, and by Email to DPIRD within 24 hours of incident.	As per consultation with DPIRD Fisheries	Reporting of marine oil pollution ¹ . Notify if spill has the potential to impact or has impacted fisheries in State waters.	Notification by Planning Section Chief (or delegate)	Not applicable
Department of Water and Environmental Regulation (DWER)	Initial verbal or electronic notification of the discharge as soon as practicable. Written notification of the incident to the CEO of the DWER, copied to the local DWER Industry Regulation Office, as soon as practicable.	<i>Environmental Protection Act 1986</i> (Section 72) Environmental Protection (Unauthorised Discharge) Regulations 2004	Call DWER 24-hour Pollution Watch Hotline. Environmental Protection Act 1986: Spill or discharge of hydrocarbons to the environment that has caused, or is likely to cause pollution, or material or serious environmental harm (Level 2/3 spills). Environmental Protection (Unauthorised Discharge) Regulations 2004: Unauthorised discharge (where there is potential for significant impact or public interest) to the environment of Schedule 1 material.	Notification by Planning Section Chief (or delegate)	Reporting requirements: https://www.wa.gov.au/service/environment/pollutant-prevention/pollution-watch
Port of Dampier / Port of Ashburton	Verbal notification immediately to Harbour Master via Dampier / Ashburton VTS. Call to The Emergency Tower mobile POLREP to WA DTMI	<i>Port Authorities Act 1999</i> Pilbara Ports Authority, Port of Dampier Handbook or Port of Ashburton Handbook	For all spills within Port of Dampier or Port of Ashburton port limits	Notification by Planning Section Chief (or delegate)	WA DTMI POLREP (Appendix C): https://www.transport.wa.gov.au/media/Files/marine/MAC-F-PollutionReport.pdf
Port of Varanus Island (VI) (Pilbara Ports Authority)	Verbal notification within 4 hours to Harbour Master via VI Port Control. Follow up report within 48 hours through the Pilbara Port Authority Hazard and Incident Reporting Form:	<i>Port Authorities Act 1999</i> Pilbara Ports Authority Port of VI Handbook	For all spills within Port of VI limits	Notification by Planning Section Chief (or delegate)	WA DTMI POLREP (Appendix C): https://www.transport.wa.gov.au/media/Files/marine/MAC-F-PollutionReport.pdf

Agency/Authority	Type of Notification/Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
	https://www.pilbaraports.com.au/safety-and-security/hazard-and-incident-reporting Follow up with POLREP as soon as practicable after verbal notification				
Varanus Island Contaminated Sites Auditor	Initial verbal or electronic notification followed by a report if confirmed contamination.	WA Contaminated Sites Act 2003	Applies if there is shoreline contact that could cause land contamination.	Notification by Planning Section Chief (or delegate)	Not applicable
Barrow Island Port Authority	Verbal notification within 4 hours. POLREP to WA DTMI.	<i>Shipping and Pilotage Act 1967</i> Barrow Island Port Information Manual	If spill EMBA is heading towards / reaches Barrow Island Port Authority limits	Notification by Planning Section Chief (or delegate).	WA DTMI POLREP (Appendix C): https://www.transport.wa.gov.au/media/Files/marine/MAC-F-PollutionReport.pdf
If Spill is Heading Towards International Waters					
DFAT (24-hour consular emergency centre)	Verbal phone call notification within 8 hours if the spill is likely to extend into international waters. Follow up with email outlining details of incident.	NP-GUI-007: National Plan Coordination of International Incidents: Notification Arrangements Guidance (AMSA, 2017b)	Notify DFAT that a spill has occurred and is likely to extend into international waters. Inform DFAT of the measures being undertaken to manage the spill. NOPSEMA, DISR and DFAT will form an inter-agency panel; the Australian Government Control Crisis Centre.	Notification by Planning Section Chief (or delegate)	Not applicable
Stakeholders (including Relevant Persons)					
WAFIC and WA commercial fisheries	Phone call within 24 hours of incident being identified with potential impact to the WA commercial fisheries. Follow up with email where available.	As per consultation with WAFIC	Should impact be expected to WA commercial fisheries	Notification by Planning Section Chief (or delegate)	Not applicable
Ngarluma Aboriginal Corporation	As soon as practicable. Oral or written notification.	As per consultation feedback	Notification of a spill event that may contact their area of interest	Notification by Planning Section Chief (or delegate)	Not applicable
Nhuwala Claim Group	As soon as practicable. Oral or written notification.	As per consultation feedback	Notification of a spill event that may contact their area of interest	Notification by Planning Section Chief (or delegate)	Not applicable

Agency/Authority	Type of Notification/Timing	Legislation/Guidance	Reporting Requirements	Responsible Person/Group	Forms
Wirrawandi Aboriginal Corporation	As soon as practicable. Oral or written notification.	As per consultation feedback	Notification of a spill event that may contact their area of interest	Notification by Planning Section Chief (or delegate)	Not applicable

¹: For clarity and consistency across Santos regulatory reporting requirements, Santos will meet the requirement of reporting a marine oil pollution incident by reporting oil spills assessed to have an environmental consequence of moderate or higher in accordance with Santos' environmental impact and risk assessment process outlined in Section 5 of the EP.

²: Santos reporting requirements only listed. For oil spills from vessels, Vessel Masters also have obligations to report spills from their vessels to AMSA RCC for spills in Commonwealth waters and to WA DTMI MEER in State waters.

Table 7-2: List of spill response support notifications

Organisation	Indicative timeframe	Type of communication	Resources available	Activation instructions	Santos person responsible for activating
AMOSC Duty Officer	Within 2 hours after identifying the need for AMOSC support.	Verbal Service Contract	Santos is a Participating Member of AMOSC and can call upon AMOSC personnel and equipment (including for oiled wildlife). Under the AMOSPlan, Santos can also call upon mutual aid from other trained industry company personnel and response equipment. AMOSC's stockpiles of equipment include dispersant, containment, recovery, shoreline clean-up, oiled wildlife and communications equipment. Equipment is located in Geelong, Fremantle, Exmouth and Broome.	Step 1. Obtain approval from Incident Commander to mobilise AMOSC. Step 2. Notify AMOSC that a spill has occurred. Put on standby as required. Activate if spill response escalates in order to mobilise spill response resources consistent with the AMOSPlan. Step 3. Email confirmation and a telephone call to AMOSC will be required for mobilisation of response personnel and equipment. Only a Santos call-out authority (registered with AMOSC) can activate AMOSC and will be required to supply their credentials to AMOSC. A signed contract note must also be completed by the Santos call-out authority and returned to AMOSC before mobilisation.	Planning Section Chief (or delegate) will notify AMOSC (upon approval from Incident Commander)
Aviation Service Provider	Within 2 hours after identifying the need for support.	Verbal	Helicopters/pilots available for aerial surveillance. Contract in place.	Phone call	Logistics Section Chief (or delegate)

Organisation	Indicative timeframe	Type of communication	Resources available	Activation instructions	Santos person responsible for activating
Duty Officers/ Incident Commanders (Woodside, Chevron, Jadestone)	Within 2 hours after identifying potential contact to their area of interest.	Verbal	Mutual aid resources (through AMOSC mutual aid arrangement).	Phone call	Incident Commander (or delegate)
Exmouth Freight and Logistics	Within 2 hours after identifying the need for support.	Verbal	Assistance with mobilising equipment and loading vessels.	Phone call	Logistics Section Chief (or delegate)
Laboratory Services provider(s) ¹⁷	When OM1: Hydrocarbon Characterisation is activated (Section 17)	Verbal	Oil analysis including gas chromatography/mass spectrometry fingerprinting.	Phone call	Planning Section Chief (or delegate)
OSM Services Provider	Operational and Scientific Monitoring Plan initiation criteria are met (Tables 9-1 and 9-2 of the Joint Industry OSM Framework [APPEA, 2021])	Verbal and written	Santos is a member of OSRL's OSM Services Supplementary Agreement, providing access to personnel and equipment for operational and scientific monitoring	<p>Refer North West Shelf OSM-BIP (7715-650-ERP-0002) Part B for full activation instructions</p> <p>Step 1. Obtain approval from Incident Commander to activate OSM Services Provider</p> <p>Step 2. Verbally notify OSM Services Provider followed by the submission of the Call Off Order Form</p> <p>Step 3. OSM Service Provider commences activation process.</p>	Environment Unit Leader (or delegate)
Waste Service Provider	As required for offshore and shoreline clean-up activities.	Verbal	Santos has contract arrangements in place with a waste service provider to take on the overall responsibility to transport and dispose of waste material generated through clean-up activities.	Phone call to the Primary Contact Person. In the event the Primary Contact Person is not available, the Secondary Contact Person will be contacted.	Logistics Section Chief (or delegate)
OSRL Duty Manager	Within 2 hours after identifying the need for OSRL support.	Verbal OSRL Mobilisation Authorisation Form	Santos has an SLA with OSRL, which includes the provision of support functions, equipment and personnel to meet a wide range of scenarios.	Step 1. Contact OSRL Duty Manager in Singapore and request assistance from OSRL.	Designated call-out authorities (including Incident Commanders)

¹⁷ Consult with Oil Spill Advisor on which lab to use

Organisation	Indicative timeframe	Type of communication	Resources available	Activation instructions	Santos person responsible for activating
			<p>At minimum OSRL will provide technical support to the IMT and place resources on standby.</p> <p>Further details available on the OSRL webpage</p>	<p>Step 2. Send notification to OSRL as soon as possible after verbal notification.</p> <p>Step 3. Upon completion of the OSRL incident notification form, OSRL will plan and place resources on standby.</p> <p>Step 4. Mobilisation of personnel (beyond 5 technical advisors x 5 days) and equipment requires signed mobilisation form by designated call-out authorities.</p>	
The Response Group	Within 2 hours after identifying the need for TRG support.	Verbal and written	Santos has arrangements with TRG for the provision of trained field response personnel.	Contact TRG Duty Officer.	Designated call-out authorities (including Incident Commanders)
RPS Group	As soon as possible but within 2 hours of incident having been identified.	Verbal and written	Santos has an agreement in place with RPS Group to allow rapid marine hydrocarbon spill modelling capability to be activated at any time during activities, which will be undertaken for any spill greater than Level 1. AMOSC can also run modelling on behalf of Santos, if required, as part of contracting arrangements with RPS Group.	Contact RPS Group Duty Officer.	Planning Section Chief (or delegate)
Wild Well Control Inc.	Within 4 hours after identifying the need for WWCI support.	LOWC only Verbal	Well intervention services. Under contract.	<p>As per Source Control Planning and Response Guideline (DR-00-OZ-20001):</p> <p>Step 1. Following Santos management confirmation of a LOWC, the Santos IMT Drilling Representative is to call the Wild Well Control 24-hour emergency hotline number to notify Wild Well Control of the incident.</p> <p>Step 2. As soon as practical after initial notification and once the scale of the subsea loss of containment is confirmed, an emergency</p>	Drilling Representative

Organisation	Indicative timeframe	Type of communication	Resources available	Activation instructions	Santos person responsible for activating
				<p>mobilisation authorisation form must be filled out, signed off by the authorised Santos Manager and sent through to Wild Well Control. Obtain the most current emergency mobilisation form from the Wild Well Control emergency hotline attendant. The form shall be submitted as directed by Wild Well Control, as advised by the emergency hotline attendant.</p>	

Table 7-3: Environmental performance – External notification and reporting

Environmental Performance Outcome	Make notifications and reports within regulatory and defined timeframes.		
Response Strategy	Control Measures	Performance Standards [EPS-ID]	Measurement Criteria
External Notifications and Reporting Plan	Response Preparedness		
	Santos Incident Response Telephone Directory (7700-670-PLA-0016.20)	[EPS-RP-001] Incident Response Telephone Directory is revised every six months.	Incident Response Telephone Directory; Document revision history
	OPEP communications test	[EPS-RP-002] OPEP contact details for regulatory and service provider notifications are checked annually.	OPEP communications test records
	Response Implementation		
	External notifications and reporting tables	[EPS-RP-003] External notification and reporting undertaken as per Table 7-1 and Table 7-2.	Incident log

8. Incident Action Planning

The incident action planning process is built on the following phases:

1. Understand the situation.
2. Establish incident priorities, objectives and tasks.
3. Develop an IAP.
4. Prepare and disseminate the IAP.
5. Execute, evaluate and revise the IAP for the next operational period.

The Santos IMT will use the IAP process to determine and document the appropriate response priorities, objectives, strategies and tasks to guide the ER which are reviewed and updated as more information becomes available. The IMT will use an IAP for each operational period following the initial first-strike assessments, notifications and activations undertaken.

When acting as the support agency, Santos may be requested by the Control Agency to develop or support the development of an IAP to help guide the ER.

The Santos IAP process is built on the phases described in Figure 8-1.

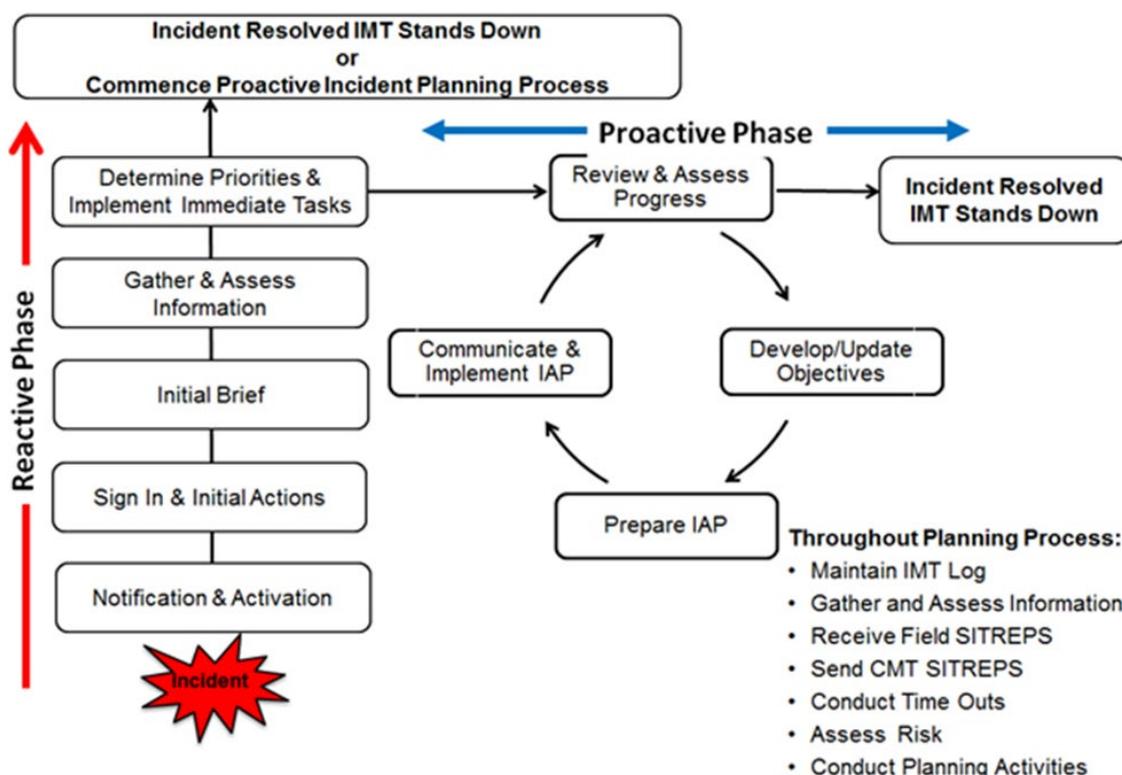


Figure 8-1: IAP Process

8.1 Reactive Phase Planning

The initial phase of the incident action planning process can be considered a reactive phase (indicatively lasting up to 48 hours) where information on the incident is being progressively established through reports coming in from the field. During this phase there is no formal IAP to follow (given the incident has just begun and details are still being established), however this OPEP has been prepared to contain all first-strike oil spill response actions required to be followed during this phase in lieu of a formal IAP.

First-strike response actions are summarised in Table 2-1 and provide links to relevant oil spill strategy sections within the OPEP. These sections contain a more detailed list of implementation actions and considerations as well as performance standards that must be followed to ensure the initial response meets regulatory requirements and environmental performance outcomes.

For each credible oil spill scenario covered by this OPEP, the first-strike response actions have been informed by a pre-assessment of applicable oil spill response strategies, priority response locations and a strategic NEBA (also referred to as a SIMA). During the reactive phase, the strategic NEBA is to be reviewed and, using the specific

information gathered from the spill, operationalised into an Operational NEBA. This assessment helps verify that the response strategies pre-selected for each spill scenario are providing the best environmental outcome for the ER.

8.2 Developing an Incident Action Plan

At the end of the reactive phase where the incident specifics have been determined, a more formal phase of spill response is entered whereby a documented IAP is developed to guide the ER activities for the next operational period. An operational period is defined as the period scheduled for execution of actions specified in the IAP. The next operational period is nominally a daily period but for long running incidents may be extended further where the pace of the ER has settled, and the level of new information has decreased.

As IAPs and response strategies are implemented their performance is monitored. The performance measurement results are fed back into the IMT to provide the IMT with greater situational awareness to enable the effective formulation of IAPs. Those response strategies that are effective are continued or increased, while those strategies that are ineffective are scaled back or ceased.

The performance against the objectives of the IAP must be documented in the incident log by the IMT. This provides the IMT with information required to assist in formulating the IAP and provides evidence of Santos' response to the incident for regulatory and legal investigations that will follow the termination of the incident.

IAP performance is monitored through IMT communication with in-field response personnel (e.g. surveillance personnel, team leaders, laboratory chemists) who report on the effectiveness of the response strategies both verbally and through logs/reports/photos sent throughout the response.

IAP forms and processes are documented in the Santos SharePoint Oil Spill Response Tile and in the SO ER Documentation SharePoint site. Access subfolders to display all forms required to conduct incident action planning. Each functional position within the IMT has subfolders carrying forms and processes unique to the functional position on the Oil Spill Tile.

8.3 Environmental Performance

Table 8-1 lists the environmental performance outcome, control measures, performance standards and measurement criteria for incident action planning.

Table 8-1: Environmental performance – incident action planning

Environmental performance outcome	Manage incident via a systematic planning process		
Response strategy	Control measures	Performance standards [EPS-ID]	Measurement criteria
Incident action planning	Response preparedness		
	IMT Exercise and Training Plan	[EPS-RP-005] Incident action planning and NEBA is practiced by the IMT during exercises.	Exercise records
	Response implementation		
	IAP	[EPS-RP-006] IAP is completed for each operational period and approved by the Incident Commander.	Incident log IAP/s
		[EPS-RP-007] Monitor effectiveness of response strategies being implemented and use information in the development of IAPs.	Incident log IAP/s
	NEBA	[EPS-RP-008] An Operational NEBA will be undertaken for each operational period of the incident.	NEBA IAP
IMT activation and de-escalation	[EPS-RP-009] IMT will be activated immediately once notified of a Level 2/3 spill (to Incident Commander).	IAP	

Environmental performance outcome	Manage incident via a systematic planning process		
Response strategy	Control measures	Performance standards [EPS-ID]	Measurement criteria
		[EPS-RP-010] The decision to de-escalate the IMT will be made in consultation with the relevant Control Agency/s, Jurisdictional Authorities and other Statutory Authorities that play an advisory role.	NEBA IAP
	TRPs	[EPS-RP-011] If monitor and evaluate shows that shoreline contact of PPAs is likely, TRPs will be developed or sought from other titleholders/ regional industries prior to shoreline contact.	TRP

9. Source Control

The initial and highest priority response to an oil spill incident following the health and safety of on-site personnel is to prevent or limit further loss of hydrocarbons to the environment.

For major hydrocarbon release incidents during the well suspension / decommissioning activities, the LWIV / MODU Operator’s ER Plan and the Santos-MODU Operator ER Bridging Plan outline the initial actions to be taken by onsite personnel to control the source of a hydrocarbon spill and limit the volume released to the environment.

For vessels with a SOPEP, the SOPEP will provide the relevant initial actions to control the source of the spill.

For the ongoing response to a LOWC incident, the Santos Offshore Source Control Planning and Response Guideline (DR-00-OZ-20001) is to be consulted as the overarching source of information for implementing a relief well response.

The sections below provide an outline of source control activities noting that the MODU Operator’s ER Plan, Vessel SOPEP and Source Control Planning and Response Guideline (DR-00-OZ-20001), where applicable, may provide a higher level of detail for specific incidents.

9.1 Vessel Collision- Fuel Tank Rupture

Table 9-1 provides the environmental performance outcome, initiation criteria and termination criteria for source control response to a fuel tank rupture. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 9-1: Source control (vessel collision) environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implementation of source control methods to stop the release of hydrocarbons into the marine environment.	
Initiation criteria	Notification of a spill	
Applicable hydrocarbons	MDO	Van Gogh Crude
	✓1	X
Termination criteria	<ul style="list-style-type: none"> Release of oil to the marine environment has ceased and the workplace environment is deemed environmentally safe and free of hydrocarbons. 	

9.1.1 Implementation Guidance

Implementation guidance is summarised in Table 9-2. In the event that MDO is released from a vessel due to a tank rupture, the relevant vessel-specific procedures will be applied. For support vessel collisions, the vessel’s SOPEP will be followed to control the source, reduce the loss of hydrocarbons and prevent escalation of the incident. Table 9-6 lists the environmental performance standards and measurement criteria for this strategy.

Table 9-2: Implementation guidance – fuel tank rupture

Action	Consideration	Responsibility	Complete
Initial actions The vessel’s SOPEP, as applicable under MARPOL, or procedure for responding to a ruptured tank will be followed, as applicable.	Notwithstanding vessel-specific procedures for source control, the following activities would be evaluated immediately for implementation, providing it is safe to do so: <ul style="list-style-type: none"> Reduce the head of fuel by dropping or pumping the tank contents into an empty or slack tank. Consider pumping water into the leaking tank to create a water cushion to prevent further fuel inventory loss. If the affected tank is not easily identified, reduce the level of fuel in the tanks in the vicinity of the 	Vessel Master	✓

Action	Consideration	Responsibility	Complete
	<p>suspected area so that the stability of the vessel will not be compromised.</p> <ul style="list-style-type: none"> Evaluate the transfer of fuel to other vessels. Trim or lighten the vessel to avoid further damage to intact tanks. Attempt repair and plugging of the hole or rupture. 		

9.2 Loss of Well Control

Table 9-3 provides the environmental performance outcome, initiation criteria and termination criteria for controlling the source of a loss of well control.

Table 9-3: Source control (loss of well control) environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implementation of source control methods to stop the release of hydrocarbons into the marine environment.		
Initiation criteria	LOWC		
Applicable hydrocarbons	MDO	Van Gogh Crude	
	X	✓1	
Termination criteria	The primary well is contained and killed to prevent any further release of hydrocarbon to the environment.		

Details of the worse-case spill scenario details are described in Section 6.1. Source control methods are described in further detail in the following sections.

9.2.1 Relief Well Drilling

Relief well drilling is the primary source control strategy to control a LOWC. The Source Control Planning and Response Guideline (DR-00-OZ-20001) outlines the overarching process for planning and mobilising personnel and equipment into the field for the purpose of drilling a relief well.

9.2.1.1 Relief well planning

Relief well planning is embedded into the Santos Drilling and Completions Management Process (DCMP). The following industry accepted guidelines have been adopted to assist relief well planning requirements.

- SPE Technical Report Calculation of Worst-Case Discharge (Rev 1) (2016): This is used as part of the prospect screening review to generate a credible rate for oil spill modelling, as well as providing an input for the dynamic kill modelling as part of the Well Specific Source Control Plan (SCP).
- Offshore Energies UK (OEUK) (2024), Relief Well Planning for Offshore Wells Guideline, Issue 3, July 2024: This methodology is used to confirm a well complexity analysis and tailor required content for the well-specific SCP to the appropriate level of detail.

A well-specific SCP will be developed to address the well specific requirements. The SCP is a Santos controlled document and is encompassed in the Well Operations Management Plan (WOMP). The SCP will contain relief well planning information, specifically:

- MODU positioning assessment for relief well drilling locations
- relief well tangible equipment requirements and availability
- relief well trajectory analysis and casing design
- dynamic well kill hydraulic simulation results.

These reports are static reports developed prior to higher-risk campaign-specific activities. While the SCP contains planning information relevant to drilling a relief well for any well release (e.g. MODU positioning locations), time-variable information, such as MODU availability, can only be assessed for the duration of the campaign.

To ensure Santos has current MODU availability, Santos maintains a register of MODU activity within the region and reviews this on a monthly basis and updates if required (i.e. if MODUs enter or depart the region). The MODU capability register includes information about:

- MODU name
- MODU contract status (operator and contract duration)
- current location
- water depth capability range
- MODU type (floating vs jack-up; mooring type; rig design/class)
- available drilling envelope
- BOP specifications
- BOP connector specifications
- mud pumps specifications/capability
- choke and kill line internal diameters
- storage capability (i.e. diesel, base-oil, brine, drill-water, potable water, bulks)
- NOPSEMA safety case (yes/no).

The SCP includes a review of the most recent MODU capability register to identify the most suitable MODU for the well. In the event a suitable MODU is not in Australian waters or is not predicted to be in Australian waters at the time of the activity, further work will be completed to identify a regionally suitable MODU, along with a mobilisation plan that demonstrates construction of a relief well within the timeframe outlined in Table 9-4. Once a MODU is allocated as a potential relief well MODU for a project, the MODU capability register will be annotated as such. As such, any change to the register on a month-to-month basis that affects a preferred MODU may trigger a revision if the capability of the MODU is materially different from that which was previously modelled in the SCP. The revision will be completed within 4 weeks of identifying the change.

Santos commits to reviewing the SCP assumptions for relief well MODU availability and verifying that a suitable relief well MODU is either in Australian waters, or there is a suitably robust plan in place to mobilise one outside of Australia. If a capable relief well MODU/s becomes unavailable during the activity, work will commence (if required) on an update to the SCP to identify a suitable replacement relief well MODU regionally along with any required pre-work (contracting/logistics plans etc).

In order to facilitate and expedite the use of a regional MODU for relief well drilling, an APPEA MoU: Mutual Assistance is in place. This agreement provides the mechanism to facilitate the transfer of drilling units and well-site services between operators in Australian and Timor Leste administered waters to respond urgently to emergency source control events.

A Safety Case Revision will be required for the relief well MODU to undertake the activity and this cannot be submitted before the event. The Safety Case Revision will be based on existing documents, specifically the Safety Case Revision approved for the drilling of the original well and the Safety Case in force for the relief well rig. A Safety Case Revision is to be submitted within 14 days from the well incident, however the critical path time allowed for the preparation of the document is three days. The remaining estimated time would be used for gathering post-event data, mobilising the workforce and conducting a hazard identification. It is not practicable to reduce the critical path days with additional pre-planning as document revision, final review and approval will still be required after completing the hazard identification.

9.2.1.2 Relief Well Schedule

An indicative relief well drilling schedule is provided in Table 9-4. This is based on control of the well by 77 days. This period is used as a base case well control timeframe by Santos based on indicative mobilisation durations, relief well planning and operations. It could take up to 44 days to have a relief well MODU onsite ready to spud. Long lead item equipment to enable a relief well to be drilled within this timeframe is held in the Santos inventory or confirmed to be available at short notice from vendors or other operators in the region.

This timeline has been assessed as ALARP based on the current controls/measures in place, however, Santos is actively working with industry to evaluate measures to improve on the ALARP response time model through the APPEA Drilling Industry Steering Committee Source Control Response Industry (SCRI) Working Group. The SCRI working group is an initiative established to drive collaboration and continuous improvement in source control emergency response planning. The working group will explore and act on opportunities to align and strengthen the Titleholders' source control emergency response capability through "mutual aid" initiatives and drive continuous improvement by implementing fit-for-purpose and effective source control emergency response strategies.

Table 9-4: Schedule for the MODU arriving on location

Task	Duration (days)	Controls
LOWC relief well		
<ul style="list-style-type: none"> Event reported. Begin sourcing of rig for relief well drilling operations. Concurrently, Stand-Up Relief Well Drilling Team and activate relief well specialists. 	3	<ul style="list-style-type: none"> On-site communications. Active IMT on call including Operations Section Chief/Relief Well Operations Lead. Stand-up Relief Well Team (as per Santos Offshore Source Control Planning and Response Guideline (DR-00-OZ-20001). Relief well drilling specialist services contract (Wild Well Control). Regional MODU tracking. APPEA MoU: Mutual Assistance.
<ul style="list-style-type: none"> Relief well MODU confirmed. Relief well MODU suspends operations and prepares to mobilise to the relief well location. Demobilisation of equipment from previous operator. Concurrently, prepare relief well MODU Safety Case Revision (SCR) and submit to NOPSEMA. Concurrently, prepare relief well design and dynamic kill plan. Prepare WOMP and submit to NOPSEMA. 	13	<ul style="list-style-type: none"> Active IMT. Santos Offshore Source Control Planning and Response Guideline (DR-00-OZ-20001). Pre-completed well specific SCP complete with relief well study. Relief well drilling specialist services contract (Wild Well Control). Regional MODU tracking. APPEA MoU: Mutual Assistance. Access relief well long lead equipment from inventory or other operators (e.g. casing and wellhead). Drilling services contracted.
<ul style="list-style-type: none"> Contract relief well MODU. Concurrently, continue preparations for rig mobilisation. Concurrently, NOPSEMA assessment of relief well MODU SCR and relief well WOMP. Mobilise relief well MODU to location. 	28	<ul style="list-style-type: none"> Active IMT. Santos Offshore Source Control Planning and Response Guideline (DR-00-OZ-20001). Relief well drilling specialist services contract (Wild Well Control Inc.).
Total days prior to arrival, ready to spud/commence relief well operations.	44	
<ul style="list-style-type: none"> Drill and construct relief well and complete dynamic well kill operations. 	33	<ul style="list-style-type: none"> Active IMT. Santos Offshore Source Control Planning and Response Guideline (DR-00-OZ-20001). Relief well drilling specialist services contract (Wild Well Control).
Total days from notification of LOWC to well kill.	77	

9.2.1.3 Emergency Subsea BOP Activation

As part of the well decommissioning activities, a blow-out preventor (BOP) stack will be installed onto the wellhead, in accordance with API Standard 53: Well control equipment systems for drilling wells (API 2018). The purpose of a BOP is to provide a secondary barrier to hydrocarbons by providing a mechanical means of shutting in the well if primary well control is lost, and hydrocarbons enter the wellbore.

Note, if the well is suspended using a LWIV, there is no BOP or landing string deployed, instead a subsea intervention lubricator/device is used for operations on live wells, which is similar to a wireline or coiled tubing BOP adapted for subsea use.

BOP Manual Activation

If primary well control actions have failed and a loss of well control incident is anticipated, or is occurring, the drilling crew will initiate emergency surface BOP activation procedures to immediately shut in the well. The relevant

BOP rams will be activated via the BOP control panel located in the drill shack. There is an additional BOP control panel located remote to the drill shack. Available BOP rams commonly include:

- pipe ram: seals the wellbore by sealing around drill pipe of a specific size
- variable-bore ram: seals the wellbore by sealing around various sizes of drill pipe / tubulars
- blind ram: seals the wellbore when there is no tubing across the BOP
- blind-shear ram: seals the wellbore by cutting through and displacing drill pipe/tubing.

One or more BOP rams may be activated depending on the status of the well and the severity of the well control incident. Once a BOP ram is closed, it cannot be opened without further hydraulic intervention. Well pressure acts to hold the ram closed. BOP shear rams often have a secondary lock to further ensure the well remains shut in.

Sealing the wellbore in this manner provides an important safety barrier. It also allows the drill crew time to consider and plan actions to bring the well back under primary control.

BOP Automatic Activation

In the event of loss of communication between the MODU and the subsea BOP (e.g., the electrical connection between the BOP control panels on the MODU and the BOP on the wellhead is severed or damaged in some way), the BOP is designed to fail-safe close automatically on loss of signal, using stored electrical and hydraulic control power from the BOP battery and accumulators. In this situation the BOP will seal the well automatically.

MODU Emergency Disconnect

In the event of a serious loss of well control incident where the safety of the MODU and crew are threatened, the MODU emergency disconnect system (EDS) will be activated. This will unlatch the lower marine riser package (LMRP) from the BOP and activate the BOP rams. The EDS is used as a 'last resort' where all other attempts at well control have been unsuccessful and the safety of the MODU and its crew is threatened to an unacceptable level.

Failure Intervention

In the unlikely event that attempts to activate the subsea BOP from the MODU have failed, and/or the fail-safe close operation of the BOP has malfunctioned, the BOP can be closed via remotely operated vehicle (ROV) hot-stab intervention. Either the ROV on the MODU or an ROV from a separate support vessel can actuate the BOP in this manner.

ROV deployment would commence as soon as practicable from the MODU if safe to do so. If an ROV was to be deployed from a support vessel, the IMT would immediately seek to source an ROV and suitable vessel to mobilise to the field and deploy the intervention ROV as soon as practicable. ROV operations would commence to navigate the ROV to the BOP and activate the BOP rams via a hydraulic hot-stab connection on the BOP side panel. This would serve to add hydraulic pressure to the BOP circuit from either the ROV pumps or an external hydraulic source, to enable manual close of the BOP rams to seal the well.

9.2.1.4 Implementation Guidance

Implementation guidance for relief well drilling is summarised in Table 9-5.

Table 9-5: Implementation guidance – relief well drilling

Action	Responsibility	Complete	
Initial actions	Relief well		
	Implement the Source Control Planning and Response Guideline (DR-00-OZ-20001).	Relief Well Operations Lead	<input type="checkbox"/>
	Notify Santos Drilling and Completions Team to assemble a Source Control Branch and immediately begin preparations.	Relief Well Operations Lead	<input type="checkbox"/>
	Notify well control service provider personnel for mobilisation.	Relief Well Operations Lead and Source Control Branch Director	<input type="checkbox"/>
	Source MODU through nearby drilling operations if available or procure from nearest operator through mutual aid agreement MoU.	Source Control Branch Director	<input type="checkbox"/>
	Refine, as necessary, the relief well pre-planned work described in Section 9.2.2 to reflect the actual depths and assess the suitability of well locations.	Source Control Branch Director	<input type="checkbox"/>

	Assess relief well equipment and personnel requirements. Procure and make ready.	Logistics Section Chief Source Control Branch Director	<input type="checkbox"/>
	Deploy equipment and personnel to site to begin operations.	Relief Well Operations Lead	<input type="checkbox"/>
Ongoing actions	Relief well		
	Design Relief Well, using relief well pre-planning work.	Source Control Branch Director	<input type="checkbox"/>
	Assess relief well equipment and personnel requirements. Procure and make ready.	Logistics Section Chief	<input type="checkbox"/>
	Deploy equipment and personnel to site to begin operations.	Relief Well Operations Lead	<input type="checkbox"/>
	Monitor progress of relief well drilling and communicate to IMT.	Relief Well Operations Lead	<input type="checkbox"/>

9.3 Environmental Performance

Table 9-6 indicates the environmental performance outcome, control measures, performance standards and measurement criteria for the source control response strategy.

Table 9-6: Environmental Performance - Source Control

Environmental Performance Outcome	Implementation of source control methods to stop the release of hydrocarbons into the marine environment.		
Response Strategy	Control Measures	Performance Standards [EPS ID]	Measurement Criteria
Response Preparedness			
Source control - vessel collision spill control	Vessel Spill Response Plan (SOPEP/ SMPEP)	[EPS-SC-001] Activity/support vessels have a SOPEP or SMPEP that outlines procedures to combat spills.	Audit records Inspection records
	Exercises conducted as per Vessel Spill Response Plan (SOPEP/ SMPEP)	[EPS-SC-002] Spill exercises on activity/support vessels are conducted as per the vessels' SOPEP or SMPEP.	Spill exercise close-out reports
Source control – BOP activation	BOP Unit	[EPS-SC-004] BOP E pressure/function tested as per API Standard 53 at regular intervals throughout the activity	BOP pressure and function tests recorded in Daily Report; Pressure tests charted
	BOP Unit	[EPS-SC-005] BOP battery and accumulators function tested prior to deployment	BOP battery and accumulators function test records.
	Emergency Disconnect System (EDS)	[EPS-SC-006] EDS function tested prior to deployment.	EDS Function Test records.
	ROV hot stab capability	[EPS-SC-007] Access to ROV capability for BOP hot-stab intervention maintained with MODU ROV contractor throughout the activity	ROV contractual arrangements
Source control – relief well drilling	Santos Source Control Planning and Response Guideline (DR-00-OZ-20001) provides guidance for well specific source control planning and response, and includes the Santos Source Control Emergency Response Plan in Section 7	[EPS-SC-022] The Santos Source Control Planning and Response Guideline (DR-00-OZ-20001) is in place during the activity.	Source Control Planning and Response Guideline (DR-00-OZ-20001)
	Well specific SCP developed prior to drilling.	[EPS-SC-023] A Well Specific Source Control Plan (SCP) is in place prior to the activity taking place. SCP will identify suitable rig availability for relief well drilling.	Well specific SCP

Environmental Performance Outcome	Implementation of source control methods to stop the release of hydrocarbons into the marine environment.		
Response Strategy	Control Measures	Performance Standards [EPS ID]	Measurement Criteria
	Relief Well Rig Capability Register is maintained prior to and throughout the activity to monitor MODUs potentially available for relief well drilling	[EPS-SC-026] Relief Well Rig Capability Register, to monitor rigs currently present in Australasia and record relevant details including rig specifications, contract status and safety case approvals, is maintained prior to and throughout the activity through monthly monitoring.	Relief Well Rig Capability Register
	Available MODU(s) confirmed to be suitable prior to well suspension / decommissioning activity. (check point is the Assurance Review prior to commencing the activity)	[EPS-SC-054] If there is a suitable MODU in Australian waters, it will be mobilised in accordance with the APPEA MoU: Mutual Assistance for relief well drilling. In the event there are no suitable MODUs available in Australia, this will trigger an additional search for the closest suitable MODUs. Contact will be made with the vessel owners to understand rig readiness and draft a logistics plan to mobilise it to Australian waters. This will be documented as an addendum to the Well Specific SCP.	Relief Well Rig Capability Register; Well specific SCP; Assurance Review Presentation.
	Contract and Equipment Access Agreement with WWC1	[EPS-SC-024] Contract and Equipment Access Agreement with Wild Well Control Inc. (WWCI) are maintained providing technical support and equipment.	Contract with WWC1
	Arrangements for source control ER personnel	[EPS-SC-025] Arrangements for access to source control personnel are maintained during the activity.	Contract/MoUs for source control personnel
	Relief well drilling supplies readily available in Western Australia	[EPS-SC-035] Long lead equipment for relief well drilling will be readily available to Santos.	Relief well equipment contract(s)/ invoice(s); Relief well equipment inventory report(s); Well-specific SCP
Response Implementation			
Source control - vessel collision spill control	Vessel Spill Response Plan (SOPEP/SMPEP) implemented	[EPS-SC-003] Actions to control spill associated with a vessel incident followed in accordance with SOPEP or SMPEP.	Vessel logs
Source control – BOP activation	BOP installed in accordance with API Standard 53	[EPS-SC-008] BOP is activated manually in accordance with MODU Operator's ER Plan.	Incident log
Source control – relief well drilling	Santos Source Control Planning and Response Guideline (DR-00-OZ-20001) provides guidance for well specific source control planning and response, and includes the Santos Source Control Emergency Response Plan in Section 7	[EPS-SC-028] Relief well drilling implemented in accordance with the Source Control Planning and Response Guideline (DR-00-OZ-20001) during a well release.	Incident log
	Santos Source Control Branch	[EPS-SC-029] Source Control Branch mobilised within 24 hours of being notified of the well release.	Incident log
	Well control specialists	[EPS-SC-031] Well control specialists mobilised within 72 hours of being notified of the well release.	Incident log
	Equipment/services for relief well drilling	[EPS-SC-030] Equipment/services for relief well drilling sourced within 5 days of the well release being identified.	Incident log

Environmental Performance Outcome	Implementation of source control methods to stop the release of hydrocarbons into the marine environment.		
Response Strategy	Control Measures	Performance Standards [EPS ID]	Measurement Criteria
	Relief well MODU	[EPS-SC-032] MODU for relief well drilling to be onsite by Day 44 from the start of a well release (as per Table 9-4).	Incident log
	Relief well construction	[EPS-SC-033] Relief well completed within 77 days from the start of a well release.	Incident log

10. Monitor and Evaluate

Understanding the behaviour and likely trajectory of an oil spill is critical to evaluate the appropriate response strategy. There are a number of methods that can be used to monitor and evaluate, including:

- vessel surveillance
- aerial surveillance
- tracking buoys
- Oil spill trajectory modelling (OSTM)
- satellite imagery

10.1 Vessel Surveillance

Table 10-1 lists the environmental performance outcome, initiation and termination criteria for this strategy.

Table 10-1: Vessel surveillance – environmental performance outcome, initiation and termination criteria

Environmental performance outcome	Implement, monitor and evaluate tactics in order to provide situational awareness to inform IMT decision-making.	
Initiation criteria	Notification of a Level 2/3 spill – may be deployed in a Level 1 incident (to be determined by OSC).	
Applicable hydrocarbons	MDO	Van Gogh Crude
	✓1	✓1
Termination criteria	<ul style="list-style-type: none"> • Vessel-based surveillance is undertaken at scheduled intervals during daylight hours and continues for 24 hours after the source is under control and a surface sheen is no longer observable, or • NEBA is no longer being achieved, or • Agreement is reached with Jurisdictional Authorities to terminate the response. 	

Direct observations from field support or other vessels can be used to assess the location and visible extent of the hydrocarbon incidents, and to verify modelling predictions and trajectories. Due to the proximity of observers to the water’s surface, vessel surveillance is limited in its coverage in comparison to aerial surveillance and may also be compromised in rough sea-state conditions or where fresh hydrocarbons at the surface pose safety risks.

10.1.1 Implementation Guidance

Table 10-2 provides guidance to the IMT on the actions and responsibilities to be considered when selecting this strategy. Table 10-3 has a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence implementation of initial vessel surveillance operations are listed in Table 10-4.

The OSC and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 10-2: Implementation guidance – vessel surveillance

Action	Consideration	Responsibility	Complete	
Initial actions	Notify nearest available support vessel to commence surveillance.	Current Santos on hire vessels or Vessels of Opportunity (VOO) can be used. Automatic Identification System (AIS) vessel tracking is available through the Santos ER intranet page.	OSC Operations Section Chief	<input type="checkbox"/>
	Source additional contracted vessels if required for assistance.	Refer to Santos Vessels for Oil Spill Response (7110-650-ERP-0001) for guidance on vessel availability monitoring and vessel types.	Logistics Section Chief	<input type="checkbox"/>
	Safety Officer to develop a safety plan for the activity with respect to potentially dangerous gases and VOCs (including applicable controls), including due regard to the Santos <i>Safe Work Practice (SWP): Site Entry Protocol in Oil Spill Response - Gas Monitoring</i>	Ambient gas testing during spills providing safe levels for operation of personnel and vessels	Operations Section Chief Safety Officer	<input type="checkbox"/>
	Record surface slick location and extent, weather conditions, and marine fauna. Complete vessel surveillance forms (Appendix E) and provide to OSC (Level 1 spills) or IMT (Level 2/3 spills).	Photographic images are to be taken where possible and included with surveillance forms. Trained observers will not be available immediately – photos and locations will provide initial information that can be interpreted by the IMT.	Vessel Observers	<input type="checkbox"/>
	Relay surveillance information (spill location, weather conditions, marine fauna sightings and visual appearance of the slick) to the IMT within 60 minutes of completing vessel surveillance.	Initial reports to the IMT may be verbal (followed by written transmission) if the vessel is out of range or has no facilities for transmitting forms.	Vessel Master and/or OSC	<input type="checkbox"/>
Ongoing actions	Review surveillance information to validate spill fate and trajectory.	-	Planning Section Chief (or delegate)	<input type="checkbox"/>
	Use available data to conduct Operational NEBA and confirm that pre-identified response options are appropriate.	-	GIS Team Leader	<input type="checkbox"/>
	Use monitor and evaluate data to periodically reassess the spill and modify the response (through the IAP), as required.	Surveillance data is useful in updating the Common Operating Picture.	Environment Unit Leader	<input type="checkbox"/>

Table 10-3: Vessel surveillance resource capability

Equipment type/ personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Contracted vessels and VOO	Santos contracted vessel providers. VOO identified through AIS Vessel Tracking.	Availability dependent upon Santos and vessel contractor activities.	Vessels mobilised from Dampier, Varanus Island, Exmouth or offshore location. Locations verified through AIS Vessel Tracking Software.	Pending availability and location. Expected within 24 hours.

Table 10-4: Vessel surveillance – first-strike response timeline

Task	Time from IMT Call-out	
IMT begins sourcing Santos contracted vessel or VOO for on-water surveillance.	<90 minutes	
Santos contracted vessel or VOO on site for surveillance.	<48 hours (daylight dependent)	
Minimum resource requirements		
One vessel. No specific vessel or crew requirements.		
Deployment location	Approx. distance to operational area (nautical miles) ¹⁸	Approx. steam time ¹⁹ (hours: minutes)
Exmouth	37 (68 km)	3:40
Varanus Island	96 (178 km)	9:40
Dampier	155 (286 km)	15:30

10.2 Aerial Surveillance

Table 10-5 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 10-5: Aerial surveillance – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implement, monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making.	
Initiation criteria	Notification of a Level 2/3 spill.	
Applicable hydrocarbons	MDO	Van Gogh Crude
	✓1	✓1
Termination criteria	<ul style="list-style-type: none"> Aerial surveillance undertaken at scheduled intervals during daylight hours and continues for 24 hours after the source is under control and a surface sheen is no longer observable, or As directed by the relevant Control Agency. 	

Aerial surveillance is used to record the presence and size of the hydrocarbon spill at the surface as well as other environmental observations including weather conditions, marine fauna and sensitive receptors in the area. Aerial surveillance provides superior coverage over vessel surveillance for estimating the spatial extent of a spill but is generally required only for larger Level 2/3 spills.

10.2.1 Implementation Guidance

Table 10-6 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy.

¹⁸ As measured to geometric centre point of operational area

¹⁹ At average rate of 10 knots

Table 10-7 provides a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence implementation of initial aerial surveillance operations are listed in Table 10-8. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 10-6: Implementation guidance – aerial surveillance

Action	Consideration	Responsibility	Complete	
Initial actions	<p>Contact contracted aviation provider – provide details of incident and request mobilisation to spill site for initial surveillance.</p> <p>If aviation asset is available near spill location, use where possible to gather as much information about the spill. If aviation asset is not available at spill location, IMT is to seek available resources through existing contractual arrangements.</p> <p>It is possible that the initial surveillance flight will not include a trained aerial surveillance observer. Initial flights can be conducted using a standard crew and initial surveillance should not be delayed waiting for trained personnel. Ensure all safety requirements are met before deployment, including details of any safety exclusion zones established (e.g. due to high VOCs).</p> <p>There should be an attempt to obtain the following data during initial surveillance:</p> <ul style="list-style-type: none"> • Name of observer, date, time, aircraft type, speed and altitude of aircraft. • Location of slick or plume (global positioning system (GPS) positions, if possible). • Spill source. • Size of the spill, including approximate length and width of the slick or plume. • Visual appearance of the slick (e.g. colour). • Edge description (clear or blurred). • General description (windrows, patches etc.). • Wildlife, habitat or other sensitive receptors observed. • Basic metocean conditions (e.g. sea state, wind, current). • Photographic/video images. 	<p>Operations Section Chief Logistics Section Chief</p>	<input type="checkbox"/>	
	<p>Source available Santos Aerial Observers, arrange accommodation/logistics and deploy to Forward Operations/Air Base Location.</p>	<p>Santos Aerial Observer list available from First-strike Resources on Santos Offshore ER intranet page.</p>	<p>Operations Section Chief Logistics Section Chief</p>	<input type="checkbox"/>
	<p>Develop flight plan to meet IMT expectations and consider other aviation operations. Expected that two overpasses per day of the spill area are completed.</p>	<p>Flight plan to confirm with OSC that aircraft are permitted in the vicinity of the spill. Flights are only to occur during daylight and in weather conditions that do not pose significant safety risks.</p>	<p>Operations Section Chief Air Operations Branch Director</p>	<input type="checkbox"/>
	<p>Pre-flight briefing</p>	-	<p>Aerial Observers Contracted Aircraft Provider/Pilots</p>	<input type="checkbox"/>
	<p>Aerial Observers to commence surveillance</p>	<p>Consider procedure for interacting with marine fauna.</p>	<p>Operations Section Chief</p>	<input type="checkbox"/>
	<p>Determine spill extent by completing Aerial Surveillance Log (Appendix F) and Aerial Surveillance Surface Slick Monitoring Template. Calculate volume of oil</p>	<p>Thickness estimates are to be based on the Bonn Agreement Oil Appearance Code (BAOAC) (refer to Appendix F).</p>	<p>Aerial Observers</p>	<input type="checkbox"/>

Action	Consideration	Responsibility	Complete	
	(Appendix G). Take still and/or video images of the slick.			
	Record presence and type of fauna by completing the Aerial Surveillance Marine Fauna Sighting Record Sheet (Appendix H).	Provide a copy of completed Record Sheets to Environment Unit Leader and OSM Implementation Lead.	Aerial Observers	<input type="checkbox"/>
	Record shoreline habitat type and degree of oiling by completing the Aerial Surveillance Shoreline Observation Log (Appendix I).	Thickness estimates are to be based on the BAOAC (Appendix F).	Aerial Observers	<input type="checkbox"/>
	Relay all surveillance records (logs, forms, photographic images, video footage) to the IMT.	Where possible, a verbal report via radio/telephone enroute providing relevant information should be considered if the aircraft has long transits from the spill location to base.	Aerial Observers Planning Section Chief Operations Section Chief	<input type="checkbox"/>
Ongoing actions	Update flight schedule for ongoing aerial surveillance as part of the broader Aviation Subplan of the IAP.	Frequency of flights should consider information needs of the IMT to help maintain the Common Operating Picture and determine ongoing response operations.	Operations Section Chief Air Operations Branch Director Planning Section Chief	<input type="checkbox"/>
	Mobilise additional aircraft and trained observers to the spill location to undertake ongoing surveillance activities.	-	Logistics Section Chief	<input type="checkbox"/>
	Update Common Operating Picture with surveillance information and provide updates to spill trajectory modelling provider.	-	Planning Section Chief (or Delegate)	<input type="checkbox"/>

Table 10-7: Aerial surveillance resource capability

Equipment type/ personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Rotary-Wing Aircraft and Flight Crew	Santos contracted provider/s	2 x Contracted (1 x primary, 1 x backup) Additional as required	Karratha Port Hedland	Activation of aerial surveillance using helicopter pilots will occur <3 hours of the spill. Helicopter on site for surveillance <6 hours of the spill (daylight dependent).
Aerial Surveillance Crew	Santos aerial observers	7 x Santos Staff	Perth and Varanus Island	24 hours - available from Day 2 of the incident.
	AMOSC Industry Mutual Aid	5 x AMOSC Staff 6 x AMOSC Core Group personnel available Additional trained industry mutual aid personnel	Australia wide	24 hours - available from Day 2 of the incident.
Drones and Pilots **secondary response to assist vessel-based surveillance	AMOSC	Drones available 24/7 through AMOSC sub-contract 3 x Pilots	Fremantle and Geelong	Response via duty officer within 15 minutes of first call. AMOSC personnel available within 1 hour of initial activation call. Equipment logistics varies according to stockpile location.
	OSRL – Third Party Unmanned Aerial Vehicles (UAV) provider	2 x qualified remote pilots, however response is on best endeavour	Australia or international	Depending on the port of departure, one to two days if within Australia.
	Local WA hire companies	10+	Perth and regional WA	-

Table 10-8: Aerial surveillance – first-strike response timeline

Task	Time from IMT call-out	
Aircraft activated for aerial surveillance.	<3 hours	
Aircraft on site for aerial surveillance.	<6 hours (daylight dependent)	
Trained Aerial Observers mobilised to airbase (Karratha).	<24 hours (daylight dependent)	
Minimum resource requirements		
<ul style="list-style-type: none"> Santos contracted helicopter and pilots (based in Dampier). Santos trained Aerial Observers. 		
Airport	Approx. distance²⁰ (nm)	Approx. flight time²¹ (hours: minutes)
Exmouth (Learmonth)	51 (94 km)	0:25
Dampier (Karratha)	156 (290 km)	1:20

²⁰ As measured to geometric centre point of operational area

²¹ At average flight speed of 120 knots

10.3 Tracking Buoys

Table 10-9 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 10-9: Tracking buoys – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implement, monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making.	
Initiation criteria	<ul style="list-style-type: none"> Notification of a Level 2 or 3 spill. May be deployed for a Level 1 spill if deemed beneficial by the OSC. 	
Applicable hydrocarbons	MDO	Caley Crude
	✓1	✓1
Termination criteria	<ul style="list-style-type: none"> Tracking buoy deployment will continue for 24 hours after the source is under control and a surface sheen is no longer observable, or As directed by the relevant Control Agency. 	

10.3.1 Implementation Guidance

Table 10-10 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 10-11 provides a list of resources that may be used to implement this strategy.

Table 10-12 provides a summary of AMOSC equipment mobilisation timeframes. Mobilisation times for the minimum resources that are required to commence implementation of this tactic are listed in Table 10-13

The OSC and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 10-10: Implementation guidance – tracking buoys

	Action	Consideration	Responsibility	Complete
Initial actions	Organise vessel to mobilise two tracking buoys from MODU.	Personnel and vessel safety is priority. Current Santos on hire vessels or VOOs can be used. AIS vessel tracking is available through the Santos ER intranet page.	OSC/Operations Section Chief	<input type="checkbox"/>
	Deploy two tracking buoys at leading edge of slick.	Give due regard to any safety exclusion zones established (e.g. due to high VOCs). Note deployment details and weather conditions in the incident log.	Vessel Master	<input type="checkbox"/>
	Inform IMT that tracking buoys have been deployed and provide deployment details. Monitor movement of tracking buoys.	Refer login details of tracking buoy monitoring website on the Santos ER intranet site.	OSC Planning Section Chief (or delegate)	<input type="checkbox"/>
	Use tracking buoy data to maintain Common Operating Picture.	Data tracked online.	Planning Section Chief (or delegate)	<input type="checkbox"/>
	Relay information to spill fate modelling supplier for calibration of trajectory modelling.	-	Planning Section Chief (or delegate)	<input type="checkbox"/>
Ongoing actions	Assess the need for additional tracking buoys in the spill scenario and identify/nominate preferred deployment locations.	IAP to provide guidance regarding any additional deployments of tracking buoys.	Planning Section Chief	<input type="checkbox"/>
	Mobilise additional tracking buoys if required from other Santos operations (Santos currently has 12 tracking buoys located on the North West Shelf) or from AMOSC stockpiles.	-	Logistics Section Chief	<input type="checkbox"/>
	Organise vessel to deploy additional tracking buoys if required.	For continuous releases over multiple days, use a rolling deployment/collection of tracking buoys to provide better coverage of plume direction.	Operations Section Chief	<input type="checkbox"/>
	Deploy tracking buoys.	-	Vessel Master	<input type="checkbox"/>
	Monitor movement of tracking buoys.	-	Planning Section Chief (or delegate)	<input type="checkbox"/>
	Relay information to spill trajectory modelling supplier for calibration of trajectory modelling.	-	Planning Section Chief (or delegate)	<input type="checkbox"/>

Table 10-11: Tracking buoy resource capability

Equipment type/personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Tracking buoys	Santos	2	Exmouth supply base	<2 hours for incident.
		4	Dampier	24-48 hours to site pending vessel availability.
		4	Varanus Island	48 hours to site pending vessel availability.
AMOSC tracking buoys	AMOSC	4	Fremantle	Response via Duty Officer within 15 minutes of first call. AMOSC personnel available <1 hour of initial activation call. Equipment logistics varies according to stockpile location (Table 10-12).
		4	Geelong	

Table 10-12: Australian Marine Oil Spill Centre Equipment mobilisation timeframes (road freight)

	Perth	Dampier	Exmouth
Perth		1-2 days / 1,530 km	1-2 days / 1,250 km
Exmouth	1-2 days / 1,250 km	<1 day / 555 km	
Broome	<2 days / 2,240 km	<1 day / 855 km	1-2 days / 1,135 km
Geelong	2-3 days / 3,395 km	4-5 days / 4,840 km	4-5 days / 4,510 km

Table 10-13: Tracking buoy – first-strike response timeline

Task	Time from IMT call-out
Tracking buoys deployed from the MODU.	<2 hours
Two tracking buoys deployed from Exmouth using vessels of opportunity.	<12 hours pending vessel availability
Minimum Resource Requirements	
Two tracking buoys for initial deployment	

10.4 Oil Spill Trajectory Modelling

Table 10-14 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 10-14: OSTM – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implement monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making.	
Initiation criteria	Notification of a Level 2 or 3 spill.	
Applicable hydrocarbons	MDO	Van Gogh Crude
	✓1	✓1
Termination criteria	<ul style="list-style-type: none"> Spill fate modelling will continue for 24 hours after the source is under control and a surface sheen is no longer observable, or until no longer beneficial to predict spill trajectory and concentrations, or As directed by the relevant Control Agency. 	

OSTM uses computer modelling (e.g. OILMAP, SIMAP) to estimate the movement, fate and weathering potential of spills. Santos has engaged RPS Group to provide forecast spill fate modelling. RPS Group use SIMAP and OILMAP modelling systems that comply with Australian Standards (ASTM Standard F2067-22: Standard Practice for Development and Use of Oil Spill Trajectory Models). RPS Group also provide the capacity for forecast air quality monitoring to enable an assessment of potential health and safety risks associated with VOCs released from a surface slick.

A particular advantage of spill trajectory modelling is that the transport and weathering of spilled hydrocarbons can be forecast, at all times of the day and night, at any location, and under any type of metocean conditions. By

contrast, aerial surveillance and vessel-based monitoring will be constrained to daytime use, and have limits imposed by the operating environment. Aerial surveillance and vessel-based monitoring are, however, essential for validation, verification and calibration of any modelling or first principal predictions.

10.4.1 Implementation Guidance

Table 10-15 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 10-16 provides a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence implementation of this tactic are listed in Table 10-17. The Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 10-15: Implementation guidance – OSTM

Action	Consideration	Responsibility	Complete	
Initial actions	Initiate OSTM by submission of an OSTM request form (Santos ER SharePoint). Request for three day forecast trajectory modelling.	-	Environment Unit Leader	<input type="checkbox"/>
	Determine requirement for gas/VOC modelling and request initiation.	Hydrocarbon releases have human health and safety considerations for responders (volatile gases and organic compounds). This is to be considered for any tactics that monitor/recover oil, especially at close proximity to the release site.	Safety Officer Environment Unit Leader	<input type="checkbox"/>
	Operational surveillance data (aerial, vessel, tracking buoys) to be given to the modelling provider to verify and adjust fate predictions of the spill and improve predictive accuracy.	-	Planning Section Chief (or delegate)	<input type="checkbox"/>
	Login to the RPS Group data sharing website and maintain connection. Download modelling results.	Data should be stored digitally and backed up on independent digital storage media. All datasets should be accompanied by a metadata summary and documented quality assurance and control procedures.	Planning Section Chief (or delegate)	<input type="checkbox"/>
	Place RPS Group modelling data into GIS/Common Operating Picture.	RPS Group to provide at least daily updates to the IMT on trajectory model outputs to inform response planning. More frequent updates can be provided if weather conditions are highly variable or change suddenly.	Planning Section Chief (or delegate)	<input type="checkbox"/>
	If chemical dispersants are considered applicable strategy for spill scenario, request modelling provider to model how dispersant addition effects the distribution and concentration of floating oil, subsea oil and shoreline loading.	Planning and Operations to provide inputs for modelled simulation based on potential/planned dispersant operations. Outputs from dispersant addition modelling to inform NEBA.	Planning Section Chief Operations Section Chief	<input type="checkbox"/>
	Identify the locations and sensitivities at risk based on the trajectory modelling and inform the IMT. Conduct Operational NEBA on proposed response strategies.	-	Environment Unit Leader	<input type="checkbox"/>
Ongoing actions	Request spill trajectory modelling be provided daily throughout the duration of the response and integrate data into Common Operating Picture.	-	Planning Section Chief (or delegate)	<input type="checkbox"/>
	Use results from other monitor and evaluate activities, and/or data derived from hydrocarbon assays of the source hydrocarbon or from other reservoirs in the region (that may be available) as input data (if or when available) to improve model accuracy.	-	Planning Section Chief (or delegate)	<input type="checkbox"/>

Table 10-16: OSTM resource capability

Equipment type/personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
RPS Group OSTM and software.	RPS Group under direct contract to Santos, also available through AMOSC.	Daily OSTM reports	Perth – digital	2–4 hours from activation

Table 10-17: OSTM – first-strike response timeline

Task	Time from IMT call-out
RPS Group OSTM activated by the IMT	<2 hours
OSTM provided to the IMT	<4 hours
Minimum Resource Requirements	
Contracted OST modellers and software. OSTM Activation Form.	

10.5 Satellite Imagery

Table 10-18 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 10-18: Satellite imagery – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implement, monitor and evaluate tactics in order to provide situational awareness to inform IMT decision making.	
Initiation criteria	Notification of a Level 2 or 3 spill.	
Applicable hydrocarbons	MDO	Van Gogh Crude
	✓1	✓1
Termination criteria	<ul style="list-style-type: none"> Satellite monitoring will continue until no further benefit is achieved from continuing, or as advised by the relevant Control Agency. 	

Satellite imagery is considered a supplementary source of information that can improve awareness but is not critical to the response, and usage is at the discretion of the IMT.

Suitable imagery may be available via satellite imagery suppliers. This can be requested through existing AMOSC and OSRL contracts. The most appropriate images for purchase will be based on the extent and location of the oil spill. Synthetic aperture radar and visible imagery may both be of value. Availability of satellite images for a specific location will be dependent on several factors including current satellite position, satellite availability/tasking and weather conditions (cloud cover obscures images).

10.5.1 Implementation Guidance

Table 10-19 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy.

Table 10-20 provides a list of resources that may be used to implement this strategy. The Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 10-19: Satellite imagery implementation guide

Action	Consideration	Responsibility	Complete	
Initial actions	Assess requirement for satellite imagery.	-	Planning Section Chief	<input type="checkbox"/>
	Notify AMOSC and OSRL Duty Officer to initiate request for available satellite imagery.	Formal written activation of resources from AMOSC and OSRL by designated call-out authorities (Santos Duty Managers/Incident Commanders) is required.	Planning Section Chief	<input type="checkbox"/>

Action	Consideration	Responsibility	Complete
Assess suitability and order imagery.	-	Planning Section Chief	<input type="checkbox"/>
	-	Planning Section Chief (or delegate)	<input type="checkbox"/>
Ongoing actions	Review satellite imagery to validate spill fate and trajectory.	Planning Section Chief	<input type="checkbox"/>
	Use satellite imagery to periodically reassess the spill and modify the response (through the IAP), as required.	Use surveillance data when updating the Common Operating Picture.	Planning Section Chief

Table 10-20: Satellite imagery resource capability

Equipment type/ personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Satellite Imagery	KSAT – activated through AMOSC. MDA – activated through OSRL.	Dependent upon overpass frequency (TBC on activation).	Digital	If satellite images are required, Santos to notify provider within 12 hours.

10.6 Environmental Performance

Table 10-21 indicates the environmental performance outcome, control measures, performance standards and measurement criteria for this response strategy.

Table 10-21: Environmental performance – monitor and evaluate

Environmental performance outcome	Implement, monitor and evaluate tactics in order to provide situational awareness to inform IMT oil spill response decision making.		
Response strategy	Control measures	Performance standards [EPS-ID]	Measurement criteria
Monitor and evaluate – vessel and aerial surveillance	Response Preparedness		
	Maintenance of MSAs with multiple vessel providers for surveillance vessel capability	[EPS-ME-001] Santos maintains MSAs with multiple vessel providers as specified in Table 10-3.	MSAs with vessel providers
	Track location of potential surveillance vessels	[EPS-ME-003] Santos maintains access to Automatic Identification System (AIS) Vessel Monitoring System to track potential surveillance vessel locations.	AIS live tracking portal
	Minimum specifications list for surveillance vessels	[EPS-ME-002] Maintain minimum specifications list for surveillance vessels to aid in rapid vessel selection	Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)
	MSA with aviation supplier for aerial surveillance capability	[EPS-ME-009] MSA in place with helicopter/aircraft provider throughout activity	MSA with aviation supplier
	Trained aerial observers available through Santos personnel	[EPS-ME-010] Santos to maintain a pool of Trained Aerial Observers.	Exercise records Training records.
	Trained aerial observers available through mutual aid arrangements facilitated by AMOSC	[EPS-ME-011] Maintenance of AMOSC contract to facilitate mutual aid	AMOSC Participating Member Contract

Environmental performance outcome	Implement, monitor and evaluate tactics in order to provide situational awareness to inform IMT oil spill response decision making.		
Response strategy	Control measures	Performance standards [EPS-ID]	Measurement criteria
		arrangements for access to Trained Aerial Observers.	
	Access to certified UAV providers.	[EPS-ME-012] Maintenance of access to UAV providers.	List of certified UAV providers; AMOSC Participating Member Contract; OSRL Associate Member Contract.
	Aircraft charter companies for fauna observations.	[EPS-ME-013] Maintain a list of aircraft charter companies that could potentially provide fauna observation services.	List of providers
Response Implementation			
	Vessel surveillance First Strike capability mobilised	[EPS-ME-004] First strike is mobilised in accordance with details and timings as specified in Table 10-4.	Incident log
	Vessel surveillance daily observation reports	[EPS-ME-007] Daily observation reports submitted to IMT until termination criteria is met.	Incident log
	Vessels and chartered surveillance aircraft compliant with Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003).	[EPS-ME-006] Vessels comply with Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003) which ensures compliance with Part 8 of the Environment Protection and Biodiversity Conservation Regulations 2000 and includes controls for minimising the risk of collision with marine fauna.	Vessel contractor procedures align with Santos' Protected Marine Fauna Interaction and Sighting Procedure; Completed vessel statement of conformance.
		[EPS-ME-014] Chartered surveillance aircraft comply with Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003) which ensures compliance with Part 8 of the Environment Protection and Biodiversity Conservation Regulations 2000 and includes controls for minimising interaction with marine fauna.	Aircraft contractor procedures align with Santos' Protected Marine Fauna Interaction and Sighting Procedure.
	Aerial surveillance First strike capability mobilised	[EPS-ME-015] First strike is mobilised in accordance with details and timings as specified in Table 10-8.	Incident log
	Aerial surveillance – two passes per day	[EPS-ME-016] Following initiation of aerial surveillance, two passes per day of spill area by observation aircraft provided.	Incident log; IAP

Environmental performance outcome	Implement, monitor and evaluate tactics in order to provide situational awareness to inform IMT oil spill response decision making.		
Response strategy	Control measures	Performance standards [EPS-ID]	Measurement criteria
	Aerial surveillance trained aerial observers	[EPS-ME-017] Trained Aerial Observers supplied from Day 2 of response.	Incident log
	Aerial surveillance flight schedules	[EPS-ME-019] Flight schedules are maintained throughout response.	IAP
	Aerial surveillance observer log	[EPS-ME-020] Observers completed aerial surveillance observer log following completion of flight.	Completed Aerial Surveillance observer logs
Monitor and evaluate – tracking buoys	Response Preparedness		
	Tracking buoys available	[EPS-ME-023] Maintenance of 10 tracker buoys throughout the activity.	Computer tracking software; Tracking buoy tests
	Response Implementation		
	Tracking buoy first strike capability mobilised	[EPS-ME-024] First strike is mobilised in accordance with details and timings as specified in Table 10-11.	Incident log
Monitor and evaluate – oil spill modelling	Response Preparedness		
	Maintenance of contract for emergency response modelling	[EPS-ME-027] Maintenance of contract for forecast spill trajectory modelling services throughout activity.	Modelling services contract
	Maintenance of access to additional emergency response modelling	[EPS-ME-028] Access to additional spill modelling capability to ensure redundancy.	Membership in place with OSRL
	Response Implementation		
	Oil spill modelling provider first contact	[EPS-ME-029] Oil Spill Modelling provider will be contacted within two hours upon notification of a Level 2 or 3 spill.	Incident log
	Oil spill modelling provider output minimum timings	[EPS-ME-030] Modelling delivered to IMT within two hours of request to service provider.	Incident log
Monitor and evaluate – satellite imagery	Response Preparedness		
	Satellite imagery and analysis capability	[EPS-ME-032] Satellite imagery and analysis accessed through third party provider activated via AMOSC and/or OSRL.	AMOSC Participating Member Contract OSRL Associate Member Contract
	Response Implementation		
	Satellite imagery and analysis provided to IMT	[EPS-ME-033] Data incorporated into Common Operating Picture and provided to spill modelling provider.	Incident log IAP

11. Mechanical Dispersion

Table 11-1 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 11-1: Mechanical dispersion – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	To create mixing for oil and water to enhance natural dispersion and biodegradation.	
Initiation criteria	Monitor and evaluate data identifies thin oil patches at the sea surface that are not naturally dissipating and is posing risks to wildlife and shorelines by remaining on the surface.	
Applicable hydrocarbons	MDO	Van Gogh Crude
	✓2	✓2
Termination criteria	<ul style="list-style-type: none"> There is no longer a noticeable reduction of surface oil resulting from the activity, or NEBA is no longer being achieved, or Unacceptable safety risks associated with gas and VOCs at the sea surface, or Agreement is reached with Jurisdictional Authorities to terminate the response. 	

11.1 Overview

This response strategy assists with the natural dispersion process, through physical agitation by using a vessel’s propellers and wake, which encourages the oil to break into smaller particle sizes that are more easily biodegraded. The two common activities associated with mechanical dispersion are:

- manoeuvring a vessel through the slick, using propeller wash and vessel wake to create mixing in the water body
- spraying water from the fire hose of a vessel and moving the vessel through the water body to create additional mixing and breakup of the slick.

11.2 Implementation Guidance

Table 11-2 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 11-3 provides a list of resources that may be used to implement this strategy. The OSC / Vessel Master and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 11-2: Implementation guidance – mechanical dispersion

Action	Consideration	Responsibility	Complete	
Initial actions	The Operational NEBA will confirm the suitability and environmental benefit of conducting mechanical dispersion at appropriate locations.	Water depth and sea state. Possible impacts to sensitive shorelines and/or wildlife. This activity is to be conducted during daylight hours only and requires a safety plan to be developed prior to implementation.	Operations Section Chief Environment Unit Leader Planning Section Chief	<input type="checkbox"/>
	Safety Officer to develop a safety plan for the activity with respect to potentially dangerous gases and VOCs (including applicable controls), including due regard to the Santos <i>Safe Work Practice (SWP): Site Entry Protocol in Oil Spill Response - Gas Monitoring</i> .	Ambient gas testing during spills providing safe levels for operation of personnel and vessels	Operations Section Chief Safety Officer	<input type="checkbox"/>
	Notify vessel-based responders to trial mechanical dispersion.	-	Operations Section Chief	<input type="checkbox"/>
	Response personnel on vessels to evaluate the effectiveness of the use of mechanical dispersion operations to reduce the volume of oil on the water surface. Communicate the information to the IMT Operations Section Chief for inclusion in Operational NEBA.	-	Vessel Master/s Santos/AMOSC Core Group Responders	<input type="checkbox"/>

Table 11-3: Mechanical dispersion resource capability

Equipment type/personnel required	Organisation	Quantity available	Location	Mobilisation timeframe
Vessel(s) undertaking other activities. Vessel(s) can be specifically contracted for the strategy if required (refer to Santos Vessel Requirements for Oil Spill Response document [7710-650-ERP-0001]).	Santos contracted vessel providers.	Availability dependent upon Santos and vessel contractor activities.	Vessels mobilised from Dampier, Exmouth and/or NW locations. Locations verified through AIS Vessel Tracking Software.	Varies subject to availability and location.

11.3 Environmental Performance

Table 11-4 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 11-4: Environmental performance – mechanical dispersion

Environmental performance outcome	To create mixing for oil and water to enhance natural dispersion and biodegradation.		
Response strategy	Control measures	Performance standards [EPS-ID]	Measurement criteria
Mechanical dispersion	Response preparedness		
	Mechanical dispersion capability in place	[EPS-MD-001] Mechanical dispersion capability in place based on Santos contracted vessels availability	Existing MSA(s) with multiple vessel providers
	Response implementation		
	Mechanical dispersion procedures in place to ensure safe and effective execution	[EPS-MD-002] Mechanical Dispersion to be conducted as per the Mechanical Dispersion Plan.	Mechanical Dispersion Plan; IAP; Incident Log.
	Operational NEBA to determine net environmental benefit	[EPS-MD-003] Operational NEBA confirms suitability and environmental benefit.	Incident Log; IAP.

12. Offshore Containment and Recovery Plan

Table 12-1 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 12-1: Containment and recovery – environmental performance outcome, initiation criteria and termination criteria

Environmental Performance Outcome	Implement containment and recovery tactics to reduce the volume of surface hydrocarbons and contact with protection priorities.	
Initiation criteria	<ul style="list-style-type: none"> Level 2 or 3 spills from a LOWC event. NEBA confirms the response strategy is beneficial. 	
Applicable hydrocarbons	MDO	Van Gogh Crude Oil
	X	✓1
Termination criteria	<ul style="list-style-type: none"> NEBA is no longer being achieved, or Agreement is reached with Jurisdictional Authorities to terminate the response. 	

12.1 Overview

Booms and skimming equipment can be used to create physical barriers on the water surface to contain and recover the oil and to remove risk of oil contacting environmental, social and cultural sensitivities. This strategy is often used in the offshore environment in close proximity to the hydrocarbon source. Once contained, an attempt to recover the hydrocarbons from the water surface can be undertaken. Table 12-2 provides applicability criteria on when containment and recovery may be a suitable response option.

Table 12-2: Containment and recovery application criteria

Criteria	Recommend	Not Recommended
Spill characteristics	<ul style="list-style-type: none"> Patchy slick. Extended operations. Surface concentrations >50 g/m² (BAOAC of 4) at a minimum, >200 g/m² (BAOAC of 5) is optimal. 	<ul style="list-style-type: none"> Situation dependent. Surface thickness <50 g/m² (BAOAC <4).
Hydrocarbon type	<ul style="list-style-type: none"> Group 3 hydrocarbons and above. Persistent components of Group 1 and 2 hydrocarbons may be suitable. 	<ul style="list-style-type: none"> Minor to moderate spills of Group 1 and 2 hydrocarbons are likely to weather rapidly. High volatiles of these hydrocarbons may be a safety risk to personnel.
Operating environment	<ul style="list-style-type: none"> Waves <1 m for nearshore containment and recovery systems (Santos containment and recovery boom). Waves <1.8 m for offshore systems. Winds <20 knots. 	<ul style="list-style-type: none"> Wave heights exceed 1.8 m. Current >0.75 knots.

12.2 Implementation Guidance

Table 12-3 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 12-4 provides a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources required to commence initial containment and recovery operations are listed in Table 12-5. The OSC and/or Incident Commander is ultimately responsible for the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 12-3: Implementation guidance – containment and recovery

Action	Consideration	Responsibility	Complete	
Initial Actions	Containment and recovery			
	Identify and activate containment and recovery equipment stockpiles. Initial equipment mobilisation from Karratha and/or Exmouth.	Initial deployment from Karratha or Exmouth pending vessel availability. Up to date stockpile information accessed through Santos' ER intranet site.	Logistics Section Chief Supply Unit Leader Operations Section Chief	<input type="checkbox"/>
	Identify suitable deployment vessels/crew. Mobilise resources to port location (Karratha and/or Exmouth).	Initial deployment from Karratha or Exmouth pending vessel availability. Preference will be for vessels and crew that are exercised in regular Santos booming exercises.	Logistics Section Chief Supply Unit Leader Operations Section Chief	<input type="checkbox"/>
	Assess the spill trajectory modelling and other monitor and evaluate data to identify operational area for containment and recovery deployments.	Refer to Table 12-2 for guidance.	Operations Section Chief Planning Section Chief	<input type="checkbox"/>
	Confirm conditions are suitable for containment and recovery activities.	Refer to Table 12-2 for guidance.	Operations Section Chief Planning Section Chief	<input type="checkbox"/>
	Mobilise deployment personnel to nominated marine base(s).	Each vessel conducting containment and recovery is to be manned with a trained AMOSC, Santos or OSRL Oil Spill Responder who is the Team Leader tasked with controlling the operations and implementing them in a safe and responsible manner. The Team Leader has the responsibility of evaluating the effectiveness of the containment and recovery operations and communicating the information to the IMT Operations Section Chief.	Operations Section Chief Logistics Section Chief	<input type="checkbox"/>
	Safety Officer to develop a safety plan for the activity with respect to potentially dangerous gases and VOCs (including applicable controls), including due regard to the Santos <i>Safe Work Practice (SWP): Site Entry Protocol in Oil Spill Response - Gas Monitoring</i>	Ambient gas testing during spills providing safe levels for operation of personnel and vessels	Operations Section Chief Safety Officer	<input type="checkbox"/>
	Coordinate aerial surveillance support to vessels to ensure they are being directed to priority locations for containment and recovery activities within operational zones.	Focus on containment and recovery activities to areas of slick of a sufficient thickness whereby containment and recovery activities will be effective. Refer to Table 12-2 for guidance.	Planning Section Chief Operations Section Chief	<input type="checkbox"/>
Direct containment and recovery operations to designated operational zones.	The base case restrictions for containment and recovery is no operations within 25 km of well site.	Operations Section Chief	<input type="checkbox"/>	

Action	Consideration	Responsibility	Complete	
	Decanting (if selected)			
	Obtain decanting approval from AMSA (Commonwealth waters) or DTMI (WA waters).	Under both MARPOL and POWBONS, decanting must be approved by the relevant Jurisdictional Authority where the discharge will occur. Approval should be sought to discharge water that has separated from oil into the apex of the already deployed containment boom system (with operational skimmer). This will increase the oil storing capacity of storage tanks.	Environment Unit Leader	<input type="checkbox"/>
	Ensure personnel onboard the vessels are familiar with the decanting procedure approved by AMSA (Commonwealth waters) or DTMI (WA waters).	-	Operations Section Chief	<input type="checkbox"/>
	Commence decanting operations, ensuring that any discharged water is directed into the apex of the already deployed containment boom system (with operational skimmer).	-	Vessel Master/s	<input type="checkbox"/>
Ensure there is sufficient temporary storage for oily wastewater onboard vessel.	-	Operations Section Chief	<input type="checkbox"/>	
Ongoing Actions	Containment and recovery			
	Coordinate the dispatch of operationally ready (all equipment and personnel on board) vessels via the IAP.	Equipment will be maintained and replaced as necessary through existing stockpiles.	Operations Section Chief	<input type="checkbox"/>
	Maintain operational zones and provide updates to Vessel Master/s on the most suitable locations for containment and recovery operations.	Continue to utilise aerial surveillance data to inform the location of operational zones.	Operations Section Chief	<input type="checkbox"/>
	Develop a waste transfer process to secondary vessel/barge to enhance containment and recovery vessel operational time, reduce port visits for waste unloading and reduce contamination.	Consider location and size/type of waste collection vessel/barge and the suitability of equipment and waste receptacles for dynamic lifts. Consider waste transfer to Dampier Port rather than Exmouth which is a small multi-use port facility.	Operations Section Chief Planning Section Chief Logistics Section Chief	<input type="checkbox"/>
	Decanting (if selected)			
	Record volumes of all water decanted.	This information must be supplied to the relevant Jurisdictional Authority.	Vessel Master/s	<input type="checkbox"/>
Manage any solid wastes generated.	-	Vessel Master/s	<input type="checkbox"/>	

Table 12-4: Containment and recovery – resource capability

Equipment type/ Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe	
Recovery booms and skimmers	Santos	Containment and recovery boom (Current Buster 4 / Expandi Boom) Comes with accessories and powerpacks Total – 4	Exmouth container – 2 x Expandi boom systems and accessories VI container – 1 x Expandi boom system and accessories, 1 x Current Buster 4 boom system and accessories	Within 24 hours (for Exmouth or Varanus Island based deployment).	
		Desmi DBD16 brush skimmer (for inshore/calm seas deployment, comes with hoses/powerpacks). Total: 2	Exmouth: 1 Varanus Island: 1	Within 12 hours (for Exmouth or Varanus Island based deployment).	
	AMOSC	Desmi Ro-boom 1500 (200 m offshore boom on hydraulic reel). Total: 18	Exmouth: 2 Fremantle: 6 Geelong: 10	Response via Duty Officer within 15 minutes of first call. AMOSC personnel available within 1 hour of initial activation call. Equipment mobilisation times vary according to stockpile location ²² (refer to Table 10-12)	
		NOFI Current Buster 2 boom system Total: 1	Geelong: 1		
		Desmi Speed Sweep boom system Total – 1	Geelong: 1		
		Skimmers – refer to Table 14-3.			
	AMSA	Ro-boom (200 m) Total: 8	Karratha: 4 Fremantle: 4	Access to National Plan equipment ²³ through AMOSC ²⁴ . Equipment mobilisation times vary according to stockpile location.	
		Vikoma Hi Sprint boom Total: 4	Karratha: 2 Fremantle: 2		
		LWS 500 weir skimmer Total: 8	Fremantle: 4 Karratha: 4		
		Desmi termite skimmer Total: 2	Fremantle: 1 Karratha: 1		
	Industry Mutual Aid Equipment		Offshore boom and skimmers	WA	Access to Industry Mutual Aid through AMOSPlan and facilitated by AMOSC.

²² The latest AMOSC equipment listings are available through AMOSC Members Hub: <https://amosc.sharepoint.com/sites/HUB/SitePages/CollabHome.aspx>

²³ The latest AMSA equipment listings for locations around Australia can be found at the AMSA National Environmental Maritime Operations Portal: <https://www.amsa.gov.au/marine-environment/pollution-response/national-environmental-maritime-operations>

²⁴ Santos will enter a contractual arrangement with AMSA to access the National Plan resources.

Equipment type/ Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
	OSRL ²⁵ (Guaranteed access to 50% by type of equipment available. Additional access considered on a case-by-case basis).	35x Ro-boom (200 m)	Singapore, UK, Bahrain, Fort Lauderdale.	Response via Duty Officer within 10 minutes of first call. Equipment mobilisation times vary according to stockpile location.
		1x Hi sprint boom (300 m)		
		15x Towing boom (current busters)		
		50 x Offshore recovery skimmers		
Offshore waste storage	AMOSC	Lancer barges (25 m ³ each) Total: 4	Fremantle: 2 Geelong: 2	Response via Duty Officer within 15 minutes of first call. AMOSC personnel available within 1 hour of initial activation call. Equipment mobilisation times vary according to stockpile location (refer to Table 10-12).
		Deck bladders (25 m ³ each) Total: 6	Fremantle: 3 Geelong: 3	
	AMSA	Vikoma flexidam (10 m ³ each). Total: 7	Fremantle: 4 Karratha: 3	Access to National Plan equipment through AMOSC. Equipment mobilisation times vary according to stockpile location.
		Canflex sea slug (10 m ³ each) Total: 2	Fremantle: 1 Karratha: 1	
		Vikoma frost barge (25 m ³ each) Total: 4	Fremantle: 2 Karratha: 2	
		Covertex tow tank (20 m ³ each) Total: 2	Fremantle: 1 Karratha: 1	
	North West Alliance Contract	Refer to Waste Management (Section 18) for details on Santos' Waste Service Provider (WSP)	Perth Karratha	<24 hours
	Santos OEG Contract	Liquid waste ISO tanks (4 m ³).	WA	<24 hours. Offshore rated ISO tanks are readily available via existing contract arrangements through OEG.
	OSRL (Guaranteed access to 50% by type of equipment available. Additional access considered on a	16x Storage barges (50 m ³ each)	Singapore, UK, Bahrain, Fort Lauderdale.	Response via Duty Officer within 10 minutes of first call. Equipment mobilisation times vary according to stockpile location.
		25x Storage barges (25 m ³ each)		

²⁵ The latest OSRL equipment inventory available to members can be found in the SLA equipment stockpile status report: <https://www.osrl.com/in-action/publications/>.

Equipment type/ Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
	case-by-case basis).			
Offshore containment and recovery deployment vessels, towing vessels and vessel crew waste transfer vessels/barges for waste oil storage and transfer.	Santos contracted vessel providers. Preference for vessels used in Santos' deployment exercises.	Varies – check through vessel contractors/Santos vessel tracking system. Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001) provides the required vessel specifications.	Exmouth, Dampier, NW locations, Singapore.	Varies subject to location/availability.
Personnel (field responders) for OSR strategies.	AMOSC Staff	12	Fremantle: 5 Geelong: 7	Response via Duty Officer within 15 minutes of first call. Timeframe for availability of AMOSC personnel is dependent on location of the spill and transport to site.
	AMOSC Core Group (Santos)	16	Perth/NW locations: 14	From <12 hours (NW based personnel) From <24 hours (Perth personnel)
			Port Bonython (SA): 2	<48 hours to WA locations
AMOSC Core Group (Industry)	As per monthly availability		Office and facility locations across Australia.	Location dependent. Confirmed at time of activation.

Table 12-5: Containment and recovery – first strike response timeline

Task	Time from IMT call-out
IMT confirms applicability of strategy and begins sourcing containment and recovery resources for applicable spills.	<4 hours
Santos Offshore Core Group members mobilised to deployment port.	<24 hours
Containment and recovery equipment (offshore booms/skimmers) mobilised to deployment port.	<24 hours
Waste storage equipment mobilised to port.	<24 hours
Suitable containment and recovery vessels mobilised to port.	24–48 hours
Containment and recovery trained personnel mobilised to deployment port.	24-48 hours
Containment and recovery operation deployed to spill site (weather/daylight dependent).	60-72 hours (weather/daylight dependent)
Minimum Resources per Containment and Recovery Unit	
<ul style="list-style-type: none"> • 2x suitable containment and recovery vessels (1x deployment vessel, 1x tow vessel). Refer to Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001) for vessel specifications. • 200 m of offshore boom. • 1x offshore skimmer appropriate to hydrocarbon type and operating conditions. • Waste storage (comprising of a combination of towable bladders, IBCs, ISO tanks, inbuilt vessel storage tanks). • Personnel: <ul style="list-style-type: none"> – 2x Vessel masters (1 x deployment vessel, 1 x tow vessel) – 2x Trained supervisors (both on deployment vessel) – 4x Deployment crew – 1x deck hand (tow vessel) • Personal protective equipment. 	

12.3 Resource requirements

For planning purposes, a J-Sweep configuration (Figure 12-1) using two vessels; one deployment vessel and one towing vessel, is assumed for each containment and recovery unit.



Figure 12-1: ‘J’ Configuration for Containment and Recovery Operations

Source: IPIECA (2016b)

The deployment vessel will be tasked to carry out the deployment of boom, skimmer and towable temporary storage barge (if required) using the towing vessel for support.

The use of vessels of an appropriate specification is essential to ensure successful containment and recovery operations. The required specifications for deployment and towing vessels are defined in Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001).

Deterministic modelling run 95 resulted in the maximum floating oil swept area over the entire simulation ≥ 50 g/m², which was approximately 3 km². The predicted floating oil ≥ 50 g/m² was limited to day 17 of the spill only; floating oil ≥ 50 g/m² was not predicted to occur at any other time during the entire simulation. Based on the predicted temporal and spatial impact, it is likely that the use of containment and recovery resources would be limited. For the purposes of resource planning for the VGA-4H GI ST1 well suspension / decommissioning activities, it has been assumed that only 1-2 containment and recovery units may be tasked (if at all) given the very limited window for effective use of this strategy.

The resources available to carry out containment and recovery operations are detailed in Table 12-4. Considering the requirement of one 200 m offshore boom and one offshore skimmer for each containment and recovery unit, Santos has access to sufficient resources through the arrangements with AMOSC and AMSA.

To ensure availability of appropriate vessels, the Santos Marine Logistics team maintains numerous service arrangements including MSAs with vessel operators, access to the IHS Maritime Portal and a service agreement with Clarksons for the provision of offshore market intelligence.

The IHS Maritime Portal allows Santos to access the real-time location of any vessel anywhere in the world which is transmitting an AIS signal. Through this portal, Santos can identify vessels in the region via the map function and access details about the basic specifications of the vessel along with the name of the vessel operator. Santos maintains MSAs with numerous vessel operators in Australia for the provision of marine services. The MSAs set out the high-level terms and conditions of engagement between the entities and will be used to gain access to additional vessels to support spill response activities. Through Clarksons Santos maintains offshore market intelligence globally with a focus on the south-east Asia region. The Santos Vessel Requirements for Oil Spill Response document (7710-650-ERP-0001) provides full details of the process by which Santos monitors vessel availability for oil pollution emergency response to ensure vessel requirements can be met in the event of a spill.

Liquid waste collection, transport and final disposal of waste received at port will be through Santos' Waste Service Provider (as detailed in Section 18).

12.4 Decanting

Decanting is an important tool needed to make efficient use of waste management resources which are often a limiting factor in containment and recovery operations. The reduction of overall waste in some circumstances can create an environmental benefit which outweighs the minimal impact caused by the release of water with very low concentrations of oil.

The *Pollution of Waters by Oils and Noxious Substances (POWBONS) Act 1987* allows for decanting for combating specific pollution incidents. Additionally, Annex 1 of MARPOL (Regulation 9) allows for decanting for combating specific pollution events to minimise the damage from pollution. Under both MARPOL and POWBONS decanting must be approved by the relevant Jurisdictional Authority. In WA State waters this is DTMI (as the Hazard Management Agency under the *Emergency Management Act 2005*) and in Commonwealth waters this is AMSA. Approval will be sought if decanting is required.

If decanting approval is not obtained through AMSA/DTMI, the complete collected oil and water will remain in the collection tanks and will be treated as waste. In this event, the duration of containment and recovery operations may be reduced due to restricted available sillage.

12.5 Environmental Performance

Table 12-6 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 12-6: Environmental performance – containment and recovery

Environmental Performance Outcome	Implement containment and recovery tactics to reduce hydrocarbon contact to surface and shoreline priority protection areas		
Response Strategy	Control Measures	Performance Standards [EPS ID]	Measurement Criteria
Offshore Containment and Recovery	Response Preparedness		
	Access to Santos containment and recovery equipment and personnel	[EPS-CR-001] Santos personnel and equipment stored and maintained / available as per Table 12-4.	Santos oil spill response team database; Santos equipment register; Exercise reports.
	Access to containment and recovery equipment and personnel	[EPS-CR-002] Maintenance of access to containment and recovery equipment and personnel through AMOSC, AMSA National Plan, OSRL and TRG throughout activity as specified in Table 12-4.	Access to National Plan resources through AMSA
			AMOSC Participating Member Contract
			OSRL Associate Member Contract
			TRG arrangements
	Waste disposal capability for containment and recovery operations in place	[EPS-CR-003] Contract for access to waste storage, transport and disposal services in place during the activity	Waste service provider contract
	Offshore waste transfer concept of operations in place	[EPS-CR-004] Offshore waste transfer concept of operations to help maximise waste storage availability for containment and recovery vessels.	Waste transfer concept of operations (within Santos Vessel Requirements for Oil Spill Response [7710-650-ERP-0001]).
	Vessel capability for containment and recovery operations	[EPS-CR-006] Santos maintains MSAs with multiple vessel providers	MSAs with multiple vessel providers
	Containment and recovery vessel requirements are identified	[EPS-CR-005] Maintenance of vessel specification for offshore containment and recovery vessels and waste storage and transport vessels	Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)
	Response Implementation		
	First strike capability mobilised	[EPS-CR-007] First strike is mobilised in accordance with details and timings as specified in Table 12-5.	Incident log
	Decanting to maximise waste storage whilst minimising environmental impact and adhering to State and Commonwealth legislation	[EPS-CR-008] Decanting operation not to commence until approved. Application for offshore decanting is made to AMSA (Commonwealth waters) or DTMI (State waters). Decanting of collected water by returning to boom apex collection area, to maximise waste storage	Incident log
Aerial surveillance information to direct operations to areas with greatest oil concentration	[EPS-CR-011] Aerial surveillance reports communicated to containment and recovery Team Leaders	Incident log	

Environmental Performance Outcome	Implement containment and recovery tactics to reduce hydrocarbon contact to surface and shoreline priority protection areas		
Response Strategy	Control Measures	Performance Standards [EPS ID]	Measurement Criteria
	Prepare operational NEBA to determine if containment and recovery activities are likely to result in a net environmental benefit	[EPS-CR-012] Records indicate operational NEBA completed prior to containment and recovery activities commencing. NEBA will consider the oil thickness and weather constraints as key factors. Operational NEBA to be undertaken each operational period.	Incident log; IAP.

13. Chemical Dispersant Application Plan

Table 13-1 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 13-1: environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implement dispersant application to enhance biodegradation of hydrocarbons and reduce the impact of surface hydrocarbons on protection priorities	
Initiation criteria	Notification of a Level 2/3 condensate spills	
Applicable hydrocarbons	MDO	Van Gogh Crude Oil
	X	✓1
Termination criteria	<ul style="list-style-type: none"> Application of chemical dispersants will cease when dispersant efficacy is no longer providing a net environmental benefit as assessed through the NEBA process, and Agreement is reached with Jurisdictional Authorities to terminate the response 	

13.1 Overview

Dispersants are chemicals that are sprayed onto floating oil slicks by vessels and/or aircraft. Dispersants are designed to separate the oil into small droplets and assist with dispersion in the water column to speed up the process of natural biodegradation. Chemical dispersants can be used to:

- decrease the concentration and volume of surface oil reaching sensitive receptors
- increase the rate of natural biodegradation
- reduce the quantity of waste created.

The operational NEBA process will consider potential impacts of both oil and dispersant on sensitive receptors, taking into account information gained from monitor and evaluate activities. This will inform decisions on dispersant use throughout the response, including application location(s), the volumes and rates at which dispersant is applied, and when to limit or cease dispersant use.

Stochastic spill modelling predicted that floating oil $\geq 50 \mu\text{m}$, which is typically considered the lowest practical threshold for effective surface dispersant application, would extend only up to around 3 km from the release location. The limited areal extent of thick slicks means that dispersant application would be targeted close to the well site, but stochastic modelling indicates that surface slicks within this zone may be of sufficient thickness to support effective dispersant application. Deterministic modelling run 95 resulted in the maximum floating oil swept area $\geq 50 \text{ g/m}^2$ over the entire simulation, which was approximately 3 km^2 . The predicted floating oil $\geq 50 \text{ g/m}^2$ was limited to occurring day 17 of the spill only; floating oil $\geq 50 \text{ g/m}^2$ was not predicted to occur at any other time during the entire simulation. Based on the predicted temporal and spatial impact, it is likely that the use of surface dispersant resources would be limited.

Accordingly, surface dispersant application is identified as a response strategy for the LOWC scenario involving Van Gogh crude.

Surface chemical dispersants are most effective on hydrocarbons that are at a thickness of 50 to 100 g/m^2 on the sea surface (refer to Section 6.2). EMSA (2010) recommends thin layers of spilled hydrocarbons should not be treated with dispersant; this includes BAOACs 1 to 3 (EMSA, 2010) (Table 13-2). IPIECA (2015) recommends that the thickest areas of oil should be targeted for effective surface dispersant application.

13.1.1 Dispersant Application Area

The base case for surface dispersant application is that no application is to occur:

- within a Habitat Protection Zone or National Park Zone of an Australian Marine Park (application permitted in the Multiple Use Zone)
- within State Marine Parks
- within State Waters
- within 10 km of water depths $< 10 \text{ m LAT}$
- within exclusion zones of offshore facilities

Table 13-2: Bonn Agreement oil agreement appearance codes

Code	Description	Layer Thickness (μm)	Litres per km^2
1	Silvery sheen	0.04 to 0.30	40 to 300
2	Rainbow sheen	0.30 to 5.00	300 to 5,000
3	Metallic	5 to 50	5,000 to 50,000
4	Discontinuous true oil colour	50 to 200	50,000 to 200,000
5	Continuous true oil colour	More than 200	More than 200,000

13.2 Vessel-based dispersant operations

For the purposes of resource planning for the VGA-4H GI ST1 well suspension / decommissioning activities, it has been assumed that only 1-2 vessel dispersant systems may be tasked (if at all), given the very limited window for effective use of this strategy; deterministic modelling has predicted only up to around 3 km of surface oiling $\geq 50 \text{ g/m}^2$ (the minimum practical surface thickness required for effective dispersant application), predicted to occur only on day 17 of the oil spill modelling simulation (refer Section 6.3).

Table 13-3 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this tactic. Table 13-4 provides a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence initial vessel dispersant operations are listed in Table 13-5. The Incident Commander is ultimately responsible for the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 13-3: Implementation guidance – vessel dispersant application

Action	Consideration	Responsibility	Complete	
Initial Actions	Confirm operational NEBA supports surface chemical dispersant application.	Oil type suits dispersant application. Surveillance to confirm oil spill thickness supports use of dispersants from vessels (e.g. BAOAC 4 to 5). Liaise with third party providers (e.g. AMOSC) as part of operational NEBA. Evaluate oil spill trajectory modelling when available. Guidance is provided as per AMSA guideline: Obtaining approval to use an oil spill control agent at sea or on a shoreline (AMSA, 2022)	Planning Section Chief Environment Unit Leader	<input type="checkbox"/>
	For dispersant use in State waters – seek approval from DTMI. If dispersant use in Commonwealth waters could impact State waters, notify DTMI.	Approval is required from the HMA/SMPC if dispersant is to be used in State waters – refer to Section 4.6.2. The DTMI SMPC requests early notification if use of dispersant in Commonwealth waters could impact State waters – refer to Section 4.6.2.	Planning Section Chief	<input type="checkbox"/>
	Activate Joint Industry OM4a: Surface Dispersant Effectiveness Monitoring via the OSM Services Provider (refer to North West Shelf OSM-BIP [7715-650-ERP-0002], Section 12)	Initiation criteria for OM4a: Surface Dispersant Effectiveness Monitoring is as follows: <ul style="list-style-type: none"> Application of dispersant has been selected as a response option. Therefore, this OMP requires immediate activation via the North West Shelf OSM-BIP (7715-650-ERP-0002), Section 12. Note that the ‘shake test’ assessment does not form part of OM4a: Surface Dispersant Effectiveness Monitoring and is usually performed as an initial assessment of dispersant efficacy.	Planning Section Chief Environment Unit Leader	<input type="checkbox"/>
	Source vessel/s for dispersant application and mobilise to nearest port for loading equipment and personnel (Exmouth or Dampier).	Vessel specification for dispersant vessels provided in ER Intranet – First Strike Resources and within Santos Vessel Requirements for Oil Spill Response document (7710-650-ERP-0001).	Logistics Section Chief	<input type="checkbox"/>
	Safety Officer to develop a safety plan for the activity with respect to potentially dangerous gases and VOCs (including applicable controls), including due regard to the Santos <i>Safe Work Practice (SWP): Site Entry Protocol in Oil Spill Response - Gas Monitoring</i>	Ambient gas testing during spills providing safe levels for operation of personnel and vessels	Operations Section Chief Safety Officer	<input type="checkbox"/>
	Mobilise dispersant operations Team Leaders and Team Members (Santos Core Group and/or AMOSC staff/ Industry Core Group) to designated port.	Each vessel undertaking dispersant application is to have personnel trained in dispersant application (e.g. AMOSC staff, Santos or Industry Core Group member) who is the Team Leader tasked with controlling the operations and implementing in a safe and responsible method. For prolonged dispersant operations, OSRL responders via Singapore may also be used.	Logistics Section Chief	<input type="checkbox"/>

Action	Consideration	Responsibility	Complete
Mobilise vessel-based dispersant application equipment and dispersant shake test kits to the designated deployment port.	Dampier Supply Base/ Exmouth Freight & Logistics to assist with local logistics and vessel loading of vessel spray systems and dispersant movement in Exmouth.	Logistics Section Chief	<input type="checkbox"/>
Mobilise AMOSC (Exmouth) / AMSA (Karratha) dispersant stock to nominated vessel deployment location (Exmouth and/or Dampier ports).	Check up to date dispersant stockpile inventories can be accessed via ER Intranet – First Strike Resources.	Logistics Section Chief	<input type="checkbox"/>
Use aerial surveillance to determine priority areas for dispersant application and define operational area for response.	Aerial surveillance reports of oil location and thickness.	Planning Section Chief Operations Section Chief	<input type="checkbox"/>
Identify safety requirements and controls associated with spraying dispersants and working over oil.	-	Safety Officer	<input type="checkbox"/>
Ensure shake jar test is conducted in-field to determine likely effectiveness of dispersant application and report results to IMT	Refer to NP-GUI-013: National Plan oil spill dispersant effectiveness field test kit operational guide , for guidance on how to conduct a dispersant field test.	Operations Section Chief	<input type="checkbox"/>
First vessel onsite is to test spray dispersant on the oil – confirm effectiveness.	Effectiveness to be recorded with photos.	Operations Section Chief	<input type="checkbox"/>
Confirm operational NEBA supports surface chemical dispersant application.	Use forecast modelling, monitor and evaluate data and dispersant efficacy results in operational NEBA.	Operations Section Chief Environment Unit Leader Planning Section Chief	<input type="checkbox"/>
If dispersant application is shown to be effective and approved for ongoing use by the Incident Commander, continue vessel operations and defining operational area.	<p>Use real-time or most recent visual surveillance observation data to develop operational zones for vessel dispersant operations.</p> <p>The base case restrictions for dispersant application are – no application:</p> <ul style="list-style-type: none"> • Within a Habitat Protection Zone or National Park Zone of an Australian Marine Park (application considered in the Multiple Use Zone) • Within State Marine Parks • Within State Waters • Within 10 km of water depths <10 m LAT • Within exclusion zones of offshore facilities <p>The above applies unless justified otherwise by the Operational NEBA, noting that no application is allowed in AMPs (outside multi-use zone) or State waters without relevant authority approval (refer to Section 4.6.2 for the process on obtaining consent for dispersant use in State waters and on notification to DTMI of use in adjacent Commonwealth waters).</p>	Incident Commander Operations Section Chief Environment Unit Leader Planning Section Chief	<input type="checkbox"/>

Action	Consideration	Responsibility	Complete
	Monitor for efficacy using the SMART Protocol (Section 13.5) as described in OM4a: Surface Dispersant Effectiveness Monitoring and provide results to the IMT.	Operations Section Chief	<input type="checkbox"/>
Ongoing Actions	Reassess dispersant use, utilising the NEBA process for each operational period. Cease application if no net environmental benefit.	Incident Commander Operations Section Chief Environment Unit Leader Planning Section Chief	<input type="checkbox"/>
	Continue to mobilise additional chemical dispersant stocks.	Logistics Section Chief	<input type="checkbox"/>
	Maintain operational zones and provide updates to Vessel Masters on most suitable locations for application.	Operations Section Chief Environment Unit Leader Planning Section Chief	<input type="checkbox"/>

Table 13-4: Vessel Dispersant application – resource capability

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Santos Vessel Dispersant Spray Systems	Santos owned	2x containers (each c/w 3x systems – dual arm, single arm & Afedo head)	Exmouth (Exmouth Freight & Logistics)	Within 48 hours mobilised to port
AMOSC Vessel Dispersant Spray System	AMOSC	1) Afedo Spray systems 2) Vikospray 3) Boom vane	1) Broome – 2; Exmouth – 1; Fremantle – 5; Geelong – 4 2) Exmouth – 1; Geelong – 2; Fremantle - 1 3) Fremantle – 1; Geelong – 1	Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call; for equipment mobilisation timeframes refer to Table 10-12.
AMSA Vessel Dispersant Spray System	AMSA	Ayles Fernie Boat Spray	Darwin – 2; Karratha – 2; Fremantle – 2	Access to National Plan equipment ²⁶ through AMOSC ²⁷ Equipment mobilisation times vary according to stockpile location.

²⁶ Updated AMSA equipment listings for locations around Australia can be found at the AMSA National Environmental Maritime Operations Portal: <https://www.amsa.gov.au/marine-environment/pollution-response/national-environmental-maritime-operations>

²⁷ Santos will enter a contractual arrangement with AMSA to access the National Plan resources

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Dispersant stocks	AMOSC ²⁸	Refer to Table 13-9		Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call; for equipment mobilisation timeframes refer to Table 10-12
	AMSA	Refer to Table 13-9		Access to National Plan equipment through AMOSC.
Dispersant spray system vessels	Santos contracted vessel providers Preference for vessels used in Santos deployment exercises	Varies – check through vessel contractors/ Santos vessel tracking system	Exmouth, Dampier, NW locations	Varies subject to location/ availability
Dispersant shake test kits	Santos	2 x systems	Exmouth (Exmouth Freight & Logistics)	Mobilised to port within 48 hours
Personnel (field responders) for OSR strategies.	AMOSC Staff	12	Fremantle: 5 Geelong: 7	Response via Duty Officer within 15 minutes of first call. Timeframe for availability of AMOSC personnel is dependent on location of the spill and transport to site.
	AMOSC Core Group (Santos)	16	Perth/NW locations: 14 Port Bonython (SA): 2	From <12 hours (NW based personnel) From <24 hours (Perth personnel) <48 hours to WA locations (Perth-based personnel)
	AMOSC Core Group (Industry)	As per monthly availability	Office and facility locations across Australia	Location dependent; confirmed at time of activation

²⁸ The latest AMOSC equipment listings are available through AMOSC Members Hub: <https://amosc.sharepoint.com/sites/HUB/SitePages/CollabHome.aspx>

Table 13-5: Vessel based dispersant application – first strike response timeline

Task	Time from IMT call-out
IMT confirms applicability of strategy and begins sourcing vessel dispersant resources for applicable spills	<3 hours
Suitable Dispersant Vessels mobilised to nearest deployment port (Dampier)	<48 hours
Santos Offshore Core Group mobilised to deployment port (Dampier)	<48 hours
Vessel spray system equipment mobilised to deployment port	<48 hours
Dispersants mobilised to port	<48 hours
Vessel spray operation commenced at spill site (weather/daylight dependent)	<72 hours (weather/daylight dependent)
Minimum Resource Requirements	
<ul style="list-style-type: none"> • Suitable dispersant application vessel – refer Santos Offshore ER Intranet and Santos Vessel Requirements for Oil Spill Response [7710-650-ERP-0001] for vessel specification • 1 x vessel dispersant spray system • Dispersant (10 m³) • 2 x Santos Core Group or Industry Core Group responders • Personal protective equipment 	

13.3 Aerial Dispersant Operations

For the purposes of resource planning for the VGA-4H GI ST1 well suspension / decommissioning activity, it has been assumed that only 1 aerial dispersant spray system from AMOSC may be tasked (if at all), based on the limited temporal and spatial impact of floating oil ≥ 50 g/m² predicted by the oil spill modelling (refer to Section 13.1).

Table 13-6 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 13-7 provides a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence initial aerial dispersant operations are listed in Table 13-7. The Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 13-6: Implementation guidance – aerial dispersant application

Action	Consideration	Responsibility	Complete	
Initial Actions	Confirm operational NEBA supports surface chemical dispersant application.	Oil type suits dispersant application. Surveillance to confirm oil spill thickness supports use of dispersants from vessels (e.g. BAOAC 4 to 5). Liaise with third party providers (e.g. AMOSC) as part of operational NEBA. Evaluate oil spill trajectory modelling when available. Guidance is provided as per AMSA guideline: Obtaining approval to use an oil spill control agent at sea or on a shoreline (AMSA, 2022)	Planning Section Chief Environment Unit Leader	<input type="checkbox"/>
	For dispersant use in State waters – seek approval from DTMI. If dispersant use in Commonwealth waters could impact State waters, notify DTMI.	Approval is required from the HMA/SMPC if dispersant is to be used in State waters – refer to Section 4.6.2. The DTMI SMPC requests early notification if use of dispersant in Commonwealth waters could impact State waters – refer to Section 4.6.2.1	Planning Section Chief	<input type="checkbox"/>
	Activate Joint Industry OM4a: Surface Dispersant Effectiveness Monitoring via the OSM Services Provider (Refer to North West Shelf OSM-BIP [7715-650-ERP-0002], Section 12)	Initiation criteria for OM4a: Surface Dispersant Effectiveness Monitoring is as follows: <ul style="list-style-type: none"> Application of dispersant has been selected as a response option. Therefore, this OMP requires immediate activation via the North West Shelf OSM-BIP (7715-650-ERP-0002), Section 12). Note that the 'shake test' assessment does not form part of OM4a: Surface Dispersant Effectiveness Monitoring and is usually performed as an initial assessment of dispersant efficacy.	Planning Section Chief Environment Unit Leader	<input type="checkbox"/>
	Mobilise initial resources for aerial application. After initial AMOSC notifications are complete, contact AMOSC Duty Officer and confirm requirements for these resources: <ul style="list-style-type: none"> Access to and mobilisation of required AMOSC dispersant stocks and associated equipment into Exmouth (AMOSC will arrange through their contracted transport provider). Activation of the Fixed Wing Aerial Dispersant Capability (FWADC) (AMOSC will activate this on behalf of Santos). Provision of trained spill responders to support operations (AMOSC Staff and Core Group). 	Refer Joint Standard Operating Procedures for FWADC. AMOSC will deploy appropriate aircraft to a designated airstrip close to the spill location (e.g. Port Hedland, Broome, Dampier, Learmonth or Exmouth Airports), and arrange for pilots, Air-Attack Supervisors, observation aircraft (one per two attack aircraft) and trained observers.	Air Operations Branch Director Logistics Section Chief Operations Section Chief	<input type="checkbox"/>

Action	Consideration	Responsibility	Complete
Finalise Fixed Wing Air Operations Plan and Air Operations Plan in consultation with AMOSC, AMSA, Aerotech First Response and other stakeholders and AMSA.	<p>Ensure flight schedule in Air Operations Plan considers requirements for other activities such as aerial surveillance sorties.</p> <p>Ensure details of any safety exclusion zones established (e.g. due to high VOCs) are given due regard and included in planning.</p>	<p>Operations Section Chief Air Operations Branch Director Planning Section Chief</p>	<input type="checkbox"/>
Using real-time or most recent visual surveillance observation data, develop operational zones for aerial dispersant operations.	<p>Focus on applying dispersant to areas of slick that threaten priority receptors and are of a sufficient thickness whereby chemical dispersants will be effective.</p> <p>The base case restrictions for dispersant application are – no application:</p> <ul style="list-style-type: none"> • Within a Habitat Protection Zone or National Park Zone of an Australian Marine Park (application considered in the Multiple Use Zone) • Within State Marine Parks • Within State Waters • Within 10 km of water depths <10 m LAT • Within exclusion zones of offshore facilities <p>The above applies unless justified otherwise by the Operational NEBA, noting that no application is allowed in AMPs (outside multi-use zone) or State waters without relevant authority approval (refer to Section 4.6.2 for the process on obtaining consent for dispersant use in State waters and on notification to DTMI of use in adjacent Commonwealth waters).</p>	<p>Operations Section Chief Incident Commander Environment Unit Leader Planning Section Chief</p>	<input type="checkbox"/>
Ensure shake jar test is conducted in-field to determine likely effectiveness of dispersant application and report results to IMT	<p>Refer to NP-GUI-013: National Plan oil spill dispersant effectiveness field test kit operational guide, for guidance on how to conduct a dispersant field test.</p>	<p>Operations Section Chief</p>	<input type="checkbox"/>
<p>Depending on the results of the shake jar test, aircraft are deployed to conduct a test spray (if vessel-based test is unavailable).</p> <p>Monitor for efficacy using the SMART Protocol (Section 13.5) as described in OM4a: Surface Dispersant Effectiveness Monitoring and provide results to the IMT.</p>	<p>Initial monitoring is likely to only include Tier I (visual monitoring) of the SMART Protocol. Observers trained in visual observation techniques should be used.</p>	<p>Operations Section Chief</p>	<input type="checkbox"/>
Conduct aerial dispersant spraying reporting effectiveness to IMT.	-	<p>Operations Section Chief Planning Section Chief</p>	<input type="checkbox"/>

Action		Consideration	Responsibility	Complete
Ongoing Actions	Conduct operational NEBA during each operational period to reassess effectiveness of application rates and dispersant efficacy.	-	Environment Unit Leader Planning Section Chief	<input type="checkbox"/>
	Continue to mobilise additional chemical dispersant stocks.	Refer to dispersant supply and logistics plan summary (0)	Logistics Section Chief	<input type="checkbox"/>
	Maintain operational zones and provide updates to pilots on most suitable locations for application.	-	Operations Section Chief Environment Unit Leader Planning Section Chief	<input type="checkbox"/>

Table 13-7: Aerial dispersant application – resource capability

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Aerotech First Response fixed wing aircraft, pilots and ground crew (Trained field response personnel - surge capacity; details provided in Appendix Q: Cumulative Response Capability Assessment)	AMOSC - Fixed Wing Aerial Dispersant Contract	4 under FWADC contract Additional aircraft potentially available through Aerotech First Response	Operations from Learmonth or Onslow airbase Aircraft initially mobilised from four bases around Australia: <ul style="list-style-type: none"> Jandakot (WA) Batchelor (NT) Parafield (SA) Scone (NSW) 	4 x air contractors to have wheels up in 4 hours from locations around Australia. Mobilisation times depend on the flight time from the location of the aircraft. Supporting equipment mobilisation (dispersants etc.) as per equipment mobilisation timeframes (Table 10-12)
Hercules C130 aircraft (Trained field response personnel - surge capacity; details provided in Appendix Q: Cumulative Response Capability Assessment)	OSRL	One aircraft	Senai, Malaysia	Wheels up in six hours Total flight time from Senai (JHB) to Karratha (KTA) is 14 hours (including one technical stop at Darwin).
Air attack (and SAR) helicopter	Santos contracted helicopter provider/s + contracted fixed wing	2 (contracted) + additional subject to availability	Karratha (primary base) Learmonth Onslow	Wheels up within one hour for Emergency Response
Dispersant	AMOSC	Refer to Table 13-9		Response via duty officer within 15 minutes of first call – AMOSC personnel available within one hour of initial activation call; for equipment mobilisation timeframes refer to Table 10-12.

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
	AMSA	Refer to Table 13-9		Access to National Plan equipment ²⁹ through AMOSC ³⁰ . Equipment mobilisation times vary according to stockpile location.
FWADC operational personnel include Air Attack Supervisor and Dispersant Coordinator	AMOSC and subcontractors via Fixed Wing Aerial Dispersant Contract	AMOSC staff + contractors as per FWADOps Plan (AMOSC, 2022)	AMOSC Fremantle AMOSC Geelong	Response via duty officer within 15 minutes of first call; timeframe for availability of AMOSC personnel dependent on location of spill and transport to site
Search and Rescue (SAR) vessel (can be double use vessel)	Santos contracted vessel providers.	Varies – check through vessel contractors/ Santos vessel tracking system	Exmouth, Dampier, NW locations	Varies subject to location/ availability

²⁹ Updated AMSA equipment listings for locations around Australia can be found at the AMSA National Environmental Maritime Operations Portal: <https://www.amsa.gov.au/marine-environment/pollution-response/national-environmental-maritime-operations>

³⁰ Santos will enter a contractual arrangement with AMSA to access the National Plan resources

Table 13-8: FWADC aerial dispersant application – Field resourcing

Aerial dispersant resource	No. required per aircraft	No. aircraft	Total no. required	Source of personnel
Support location (AMOSC FWADC Airbase FOB, likely to be Karratha Airport [KTA])*				
FOB Commander*	n/a	n/a	1	AMOSC FWADC contract
Airbase Manager*			1	AMOSC FWADC contract
Safety Officer*			1	AMOSC FWADC contract
Dispersant Operations Coordinator*			1	AMOSC FWADC contract
Dispersant Loading Crew*			2	AMOSC FWADC contract
Log/Admin*			1	AMOSC FWADC contract
Airbase FOB total:			7	
AMOSC FWADC Dispersant Ops. Group (at sea ops. at application site)				
Dispersant Application Air Tractors				
Air Tractor Pilot†	1	1	1	AMOSC FWADC contract / Ad-hoc contract~
Air Tractor First Officer†	1	1	1	AMOSC FWADC contract / Ad-hoc contract~
Air Attack Helicopters				
Secondary Overhead Aircraft Pilot†	1	1	1	Santos contracted
Secondary Overhead Aircraft First Officer†	1	1	1	Santos contracted
Air Attack Supervisor*	1	1	1	AMOSC
Dispersant Group total:			5	
Total personnel:			12	

* These roles as per Aerotech First Response (AFR)/AMOSC/Core Group fixed wing aerial response personnel resourcing in AMOSC FWADOps Plan (AMOSC, 2022)

† As stated in the FWADOps Plan, these roles are subject to Civil Aviation Safety Authority (CASA) requirements. The numbers stated above are reasonable estimates.

Table 13-9: Aerial dispersant operations – first strike response timeline

Task	Time from IMT call-out
IMT confirms applicability of strategy and activates Fixed Wing Aerial Dispersant Capability (FWADC)	<3 hours
AMOSC to mobilise Fixed Wing aircraft to nominated airbase	<12 hours
AMOSC to mobilise dispersants to nominated airbase	<24 hours
AMOSC to mobilise all FWADC capability personnel to nominated airbase	<48 hours (weather/daylight dependent)
AMOSC/Santos to mobilise helicopter to nominated airbase to support air attack surveillance	
AMOSC/Santos to mobilise vessel to nominated port to provide SAR support	
First FWADC test spray	
Minimum Resource Requirements	
<ul style="list-style-type: none"> 1 fixed wing aircraft (Aerotech First Response) 1 air attack / aerial observation aircraft 1 SAR Vessel WA AMOSC dispersant stocks to deployment airbase (refer to Table 13-3 and 0) 	

Task	Time from IMT call-out
<ul style="list-style-type: none"> • AMOSC contracted FWADC capability personnel: <ul style="list-style-type: none"> – Pilots – Air Attack Supervisor – Aerial Observer – FOB Commander – Airbase Manager – Dispersant Coordinator – Dispersant Loading Crew – Log/ Admin. 	

13.4 Dispersant Selection Process

13.4.1 Dispersant Use

Dispersants should only be used when the risks to the environment as a whole associated with their use have been analysed, and it has been determined that there would be a net environmental benefit from their use. The type of dispersant that will be effective is influenced by the oil type and metocean conditions (Hook & Lee, 2015).

Most of the knowledge on the biological impacts of dispersants has been developed via laboratory experiments (Quigg et al., 2021) rather than from in-situ use. This is also the case for those dispersants listed as approved in the National Plan for Maritime Environmental Emergencies Register of Oil Spill Control Agents (OSCA). Before a dispersant can be considered for use by AMSA, its toxicological impact must be tested on a diverse range of aquatic taxa, including algae, invertebrates and fish (Hook & Lee, 2015). This screening process ensures that these compounds have comparatively low toxicity (according to US Environmental Protection Agency criteria; Hemmer et al., 2011) and that they are much less toxic than oil (Hook & Lee, 2015).

Although surface dispersants have been used as an oil spill response technique for multiple spills across the globe since the 1970s, there is a lack of information about the long-term consequences of dispersant use in the marine environment (Quigg et al., 2021). However, the available research has found no compelling evidence that at low to moderate oil concentrations that chemically dispersed oil was any more toxic than oil alone (NASSEM, 2020). However, at high concentrations the combination of oil and dispersant appeared more toxic (Quigg et al., 2021), suggesting caution should be applied when considering dispersant application rates and volumes. This also shows the importance of ongoing dispersant effectiveness monitoring (Section 13.5) and its application through the operational NEBA process.

13.4.2 Dispersant Selection

Chemical dispersants listed as approved in the National Plan for Maritime Environmental Emergencies Register of Oil Spill Control Agents (OSCA) are to be prioritised for use. OSCA listed dispersants are readily available to Santos from AMOSC, OSRL and AMSA. These include Slickgone NS, Slickgone EW, Corexit EC9500A, Corexit 9527 (transitional acceptance) and Finasol 52. As described in Section 13.6 there are sufficient stockpiles of these dispersants in Australia to service the entire duration of surface application. Safety data sheets for these products are available at the AMSA register of oil spill control agents, and for Corexit 9527 (which has transitional acceptance), at the manufacturer's website.

If dispersant types additional to those on the OSCA register are required, Santos will use its Offshore Division Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001) before application. The procedure requires a dispersant to be risk assessed and deemed environmentally acceptable. The criteria used for environmental acceptability includes aquatic toxicity, biodegradation and bioaccumulation potential data. Finasol OSR 52 has been pre-assessed as low risk using this procedure and therefore is designated as acceptable for use.

If sufficient data are available, the chemical is risk assessed using the Offshore Chemical Notification Scheme (OCNS) CHARM or non-CHARM models depending on the model's applicability criteria. Chemicals that meet the selection criteria belonging to CHARM colour-band Gold or Silver, or non-CHARM groups D or E are considered environmentally acceptable. According to the OCNS CHARM model, Gold-ranked chemicals have a maximum Hazard Quotient (HQ) of <1, and Silver, HQ ≥1 and <30. According to the OCNS non-CHARM model guidelines, the worst-case initial OCNS grouping would be group B based on aquatic toxicity data of LC50 or EC50 >1 to 10 ppm. To obtain a final OCNS grouping of D, the chemical would need to be readily biodegradable (>60% biodegradation in 28 days) and non-bioaccumulative (Log Pow <3 or Bio-concentration Factor (BCF) ≤100 and molecular weight ≥700). The best case initial OCNS grouping would be group E based on aquatic toxicity data of LC50/EC50 >1,000 ppm. The best case final OCNS grouping would remain E with the chemical readily biodegradable and non-bio-accumulative.

If the chemical cannot be rated using the method described above, it would be assigned a pseudo OCNS CHARM or non-CHARM group ranking. If insufficient ecotoxicity data are available to either rate the chemical or assign a pseudo ranking, robust justification demonstrating its environmental acceptability shall be provided, based on volume/concentration, receiving marine environment characteristics and ecotoxicity data (aquatic toxicity, biodegradability and/or bioaccumulation data where applicable; i.e. biodegradation and bioaccumulation potential are not applicable to inorganic substances).

During a response, chemical dispersant shall be tested on the released oil at a laboratory as part of the initial operational monitoring (refer to Section 17) as well as through field testing using dispersant shake test kits/ vessel-based spray systems. The DBCA ESC can also advise on the location of AMSA National Plan Dispersant Effectiveness Test Kits, which could be used in addition to Santos' dispersant efficacy testing resources.

13.5 Dispersant Effectiveness Monitoring

Santos will conduct dispersant effectiveness monitoring in accordance with the North West Shelf OSM-BIP (7715-650-ERP-0002) Joint Industry OSM Framework (APPEA, 2021). For surface dispersant, this calls for the implementation of the OM4a: Surface Dispersant Effectiveness Monitoring. This monitoring is conducted after the initial shake test and is based on the SMART protocol. Refer to Section 17, the North West Shelf OSM-BIP (7715-650-ERP-0002), and the relevant OMPs for further information.

13.6 Surface Dispersant Supply and Logistics Requirements

A LOWC from VGA-4H GI ST1 well suspension / decommissioning has a peak flow rate of 219 m³/day, with peak rate reached in week 11 of the release. As noted in Section 13.2, deterministic modelling has predicted only up to around 3 km of surface oiling ≥50 g/m² (the minimum practical surface thickness required for effective dispersant application), predicted to occur only on day 17 of the oil spill modelling simulation.

For the purposes of a capability assessment, it has been highly conservatively assumed that the peak flow rate is constant over 77 day duration of the release and that the entire daily flowrate of 219 m³/day would be available for treatment on the sea surface. Modelling (RPS, 2025) predicts the Van Gogh Crude is highly persistent with the majority of the volume remaining as surface oil irrespective of the environmental conditions. Approximately 90% of Van Gogh Crude is predicted to remain on the surface after 24 hours (approximately 197 m³). To treat this volume of surface oil at a DOR of 1:25 would require 8.8 m³ of dispersant per day, or 678 m³ over a spill duration of ~77 days. The dispersant stockpiles available to Santos in Australia would be sufficient to supply dispersant for the duration of operations.

Existing dispersant supply stocks are shown in Table 13-10.

Dispersant stockpiles are made available via AMOSC membership or via AMSA with most supplies within Australia being available within 48 to 55 hours. Santos can supply all required road logistics to meet these timeframes through its contracted logistics provider. Santos can also provide air logistics for all other stockpiles throughout Australia and internationally. Due to the low volume of dispersant required over the 77 day application period, it is anticipated that dispersant stocks would not have to be imported from international stockpiles.

Table 13-10: Dispersant supply stock locations and volumes

Source	Stock Location	Volume (m ³)	Type	Total Volume (m ³)
AMSA	Adelaide	10	Slick Gone EW	355
		10	Slick Gone NS	
	Brisbane	10	Slick Gone EW	
		10	Slick Gone NS	
	Townsville (QLD)	10	Slick Gone EW	
		15	Slick Gone NS	
	Karratha	10	Slick Gone EW	
		10	Slick Gone NS	
	Darwin	10	Slick Gone EW	
		10	Slick Gone NS	
	Devonport (TAS)	10	Slick Gone EW	
		10	Slick Gone NS	

Source	Stock Location	Volume (m ³)	Type	Total Volume (m ³)
	Fremantle	48	Slick Gone NS	
		52	Slick Gone EW	
	Horne Island (QLD)	10	Slick Gone NS	
	Melbourne	10	Slick Gone EW	
		10	Slick Gone NS	
	Sydney	45	Slick Gone NS	
55		Slick Gone EW		
AMOSC	Exmouth	75	Slick Gone NS	511
	Perth (Welshpool)	8	Slick Gone NS	
		27	Corexit 9500	
		500 - SFRT stockpile* (50% available for surface dispersant use)	Slick Gone NS	
	Altona North (VIC)	75	Slick Gone NS	
		62	Corexit 9500	
Broome	14	ARDROX 6120		
OSRL (SLA stockpile)	Various (Singapore, UK, Bahrain, US)	circa. 750 [†]	Slick Gone NS Slick Gone EW Slickgone LTSW Finasol OSR 52 Corexit 9500	750
Total				1,616
OSRL Global Dispersant Stockpile (GDS)	Various (Singapore, UK, France, South Africa, USA, Brazil)	5,000 [†]	Slick Gone NS Finasol OSR 52 Corexit 9500	5,000
Total (including additional OSRL GDS stocks)				6,616

* As per the AMOSPlan, there is a provision made by the SFRT Steering Committee to provide up to 250 m³ of dispersant into a surface spill response, given certain provisions are met in the first instance by AMOSC (AMOSC, 2021).

† Subject to re-supply considerations, a Member may access up to 100% of the global SLA stockpile if required.

13.7 Environmental Performance

Table 13-11 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 13-11: Environmental performance – dispersant application

Environmental Performance Outcome	Implement chemical dispersant application to enhance biodegradation of hydrocarbons and reduce the impact of surface hydrocarbons on protection priorities.		
Response Strategy	Control Measures	Performance Standards [EPS-ID]	Measurement Criteria
Chemical dispersant application - surface	Response Preparedness		
	Arrangements to enable access to dispersants, equipment and personnel	[EPS-CD-001] Maintenance of access to dispersant, application equipment and personnel through AMOSC, AMSA National Plan and OSRL throughout activity as specified in Table 13-10 and Table 13-11.	Access to National Plan resources through AMSA
			OSRL Associate Member contract and GDS Supplementary Agreement

Environmental Performance Outcome	Implement chemical dispersant application to enhance biodegradation of hydrocarbons and reduce the impact of surface hydrocarbons on protection priorities.		
Response Strategy	Control Measures	Performance Standards [EPS-ID]	Measurement Criteria
			TRG arrangements
	Maintenance of MSAs with multiple vessel providers	[EPS-CD-010] Santos maintains MSAs with multiple vessel providers that could be used to source vessels for dispersant application	MSAs with vessel providers
	Dispersant application vessel requirements are identified	[EPS-CD-009] Maintenance of vessel specification for dispersant application vessels	Vessel specification within Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)
Response Implementation			
	Mobilisation of first strike resources	[EPS-CD-013] First-strike is mobilised in accordance with details and timings as specified in first-strike response timeline tables (Vessel-based dispersant application – Table 13-4, Aerial dispersant operations –Table 13-98).	Incident log
	Process in place for dispersant selection	[EPS-CD-002] Only chemical dispersants that are listed as approved on the National Plan Oil Spill Control Agent (OSCA) list, or are evaluated as acceptable as per the Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001), are to be used	National Plan Oil Spill Control Agent (OSCA) list; Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001); Chemical Dispersant Application Plan; Incident Log.
	Chemical Dispersant Application Plan	[EPS-CD-015] Santos will have access to dispersants specified in Table 13-10.	Incident Log
	Operational monitoring of surface dispersant efficacy will be conducted	[EPS-CD-020] Santos will conduct surface dispersant efficacy monitoring in accordance with the North West Shelf OSM-BIP (7715-650-ERP-0002) and OM4a: Surface Dispersant Effectiveness Monitoring (APPEA, 2021).	Incident Log; Chemical Dispersant Application Plan.
	Field testing of dispersant amenability	[EPS-CD-021] Analysis of dispersant amenability provided to IMT within 24 hours of oil delivery to laboratory	Incident Log; Dispersant Amenability Report.
	Field testing of dispersant / oil samples for ecotoxicity	[EPS-CD-022] If amenable to surface dispersants, and required oil volume can be collected, oil and dispersant samples to be sent for laboratory ecotoxicity testing of oil and chemically dispersed oil.	Incident Log; Dispersant Ecotoxicity Report.
	Test spray for assessment of dispersant effectiveness – aerial	[EPS-CD-024] If dispersant application is approved by the Incident Commander for aerial application, a test spray run via the National Plan Fixed-wing Aerial Dispersant Contract will be conducted to assess dispersant effectiveness	Incident Log; IAP.
	Test spray for assessment of dispersant effectiveness – vessel	[EPS-CD-011] If dispersant application is approved by the Incident Commander for vessel application, a test spray will be conducted to assess dispersant effectiveness	Incident Log; IAP.

Environmental Performance Outcome	Implement chemical dispersant application to enhance biodegradation of hydrocarbons and reduce the impact of surface hydrocarbons on protection priorities.		
Response Strategy	Control Measures	Performance Standards [EPS-ID]	Measurement Criteria
	Prepare operational NEBA to determine if chemical dispersant application activities are likely to result in a net environmental benefit	<p>[EPS-CD-016] Records indicate operational NEBA completed prior to chemical dispersant activities commencing. Operational NEBA to be undertaken each operational period and included in development of following period IAP.</p> <p>NEBA will consider the following information:</p> <ul style="list-style-type: none"> • forecast spill modelling of oil comparing simulations with and without effect of chemical dispersants • laboratory dispersant efficacy testing results • Monitor and evaluate and operational monitoring results showing distribution of floating, stranded oil and location of sensitive fauna and habitats • operational water quality monitoring results showing distribution and concentration of subsea oil (once available) • scientific monitoring water quality sampling results (once available) • consultation with Control Agency and/or key stakeholders 	Incident Log; IAP.
	Dispersant application area to be defined to minimise impacts to sensitive areas	<p>[EPS-CD-018] Surface Dispersant Application Area will be defined as part of the IAP. The base case for dispersant application is that no dispersants to be applied within:</p> <ul style="list-style-type: none"> • 10 km of water depths <10 m LAT • safety exclusion zones of offshore facilities • a Habitat Protection Zone or National Park Zone of an AMP (application considered in the Multiple Use Zone) • State Marine Parks • State waters 	IAP
	Dispersant application to target thick oil to maximise efficacy and minimise over application	[EPS-CD-019] Surface dispersant will only be applied in the dispersant application area and target oil above BAOAC 4 and 5	Operational monitoring reports; IAP; Incident Log.

14. Shoreline Protection and Deflection Plan

Table 14-1 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 14-1: Shoreline protection and deflection – objectives, initiation criteria and termination criteria

Environmental Performance Outcome	Implement shoreline protection and deflection tactics to reduce hydrocarbon contact with coastal protection priority areas	
Initiation criteria	<ul style="list-style-type: none"> Level 2 or Level 3 spills where shorelines with identified or potential protection priority areas will potentially be contacted Approval has been obtained from the relevant Control Agency to initiate the response strategy 	
Applicable hydrocarbons	MDO	Van Gogh Crude Oil
	X	✓2
Termination criteria	<ul style="list-style-type: none"> NEBA has determined that this strategy is unlikely to result in an overall benefit to the affected shoreline/s, or Agreement is reached with Jurisdictional Authorities to terminate the response strategy 	

14.1 Overview

Protection and deflection tactics are used to divert hydrocarbons away from sensitive shoreline receptors and are more effective if they are deployed ahead of spill contact. They are typically used to protect smaller, high priority sections of shoreline.

The effectiveness of this response will be dependent on spill characteristics, hydrocarbon type, and the operating environment. Deployment is subject to safety constraints such as the potential grounding of vessels.

The effectiveness of this response will be dependent on spill characteristics, hydrocarbon type, and the operating environment. Deployment is subject to safety constraints such as the potential grounding of vessels.

Protection and deflection is part of an integrated nearshore/shoreline response to be managed by the relevant Control Agency. Where Santos is not the Control Agency (refer to Table 4-2), it will undertake first strike protection and deflection activities as required. In this circumstance, the relevant Control Agency will direct resources (equipment and personnel) provided by Santos for the purposes of shoreline protection. Santos will provide all relevant information on shoreline character and oiling collected as part of surveillance activities carried out under its control (refer to the North West Shelf OSM-BIP (7715-650-ERP-0002)).

In the event of a spill with the potential for shoreline contact where Santos is not the Control Agency, the ongoing response objectives, methodology, deployment locations and resource allocation will be controlled by the relevant Control Agency and therefore may differ from that included below.

Information gathered during monitor and evaluate activities and operational monitoring (including shoreline clean-up assessments) and assessed through an Operational NEBA will guide the selection of protection and deflection locations and techniques.

Shoreline protection and deflection techniques include:

- nearshore booming, which can involve different booming arrangements, including:
 - exclusion booming: boom acts as a barrier to exclude the spill from areas requiring protection
 - diversion booming: booms divert the spill to a specific location where it may be removed (e.g. sandy beach)
 - deflection booming: booms deflect the spill away from an area requiring protection.
- berms, dams and dykes – uses sandbags or embankments to exclude oil from sensitive areas
- shoreside recovery – uses nearshore skimmers to collect oil corralled by nearshore booms (also used during shoreline clean-up)
- passive recovery – uses sorbent booms or pads to collect oil and remove it from the environment. This can be used as a pre-impact tactic where sorbents are laid ahead of the spill before making contact with the shoreline
- non-oiled debris removal – removes debris from the shoreline before it is impacted to reduce overall waste volumes from shoreline clean-up.

The effectiveness of these techniques will be dependent on local bathymetry, sea state, currents/tides and wind conditions and the available resources.

Santos has access to sufficient resources through its existing resource capability (Table 14 3).

14.2 Implementation Guidance

Table 14-2 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. Table 14-3 provides a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence initial protection and deflection operations, unless directed otherwise by the relevant Control Agency, are listed in Table 14-4. The Incident Commander of the Control Agency's IMT (once they assume control) is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 14-2: Implementation guidance – shoreline protection and deflection

Action	Consideration	Responsibility	Complete	
Initial Actions	Ensure initial notifications to the relevant Control Agency have been made.	Refer to Section 7 for reporting requirements.	Planning Section Chief	<input type="checkbox"/>
	Collect and provide monitor and evaluate information, operational monitoring data and existing sensitivity information/mapping to the Control Agency for confirmation of PPAs and NEBA.	-	Environment Unit Leader Planning Section Chief	<input type="checkbox"/>
	Actions below are indicative only and are at the final determination of the relevant Control Agency			
	Conduct Operational NEBA to determine if protection and deflection is likely to result in a net environmental benefit using information from shoreline clean-up assessments (North West Shelf OSM-BIP [7715-650-ERP-0002]).	TRPs exist for most of the PPAs for this activity, further described in Section 6.5.1. TRPs are available on the Santos ER Intranet page ³¹ . Engage a Heritage Adviser if spill response activities overlap with potential areas of cultural significance.	Environment Unit Leader	<input type="checkbox"/>
	If NEBA indicates that there is an overall environmental benefit, develop a Shoreline Protection Plan (IAP Sub-Plan) for each deployment area.	Shoreline Protection Plan may include: <ul style="list-style-type: none"> • Priority nearshore and shoreline areas for protection (liaise with Control Agency for direction on locations). • Locations to deploy protection and deflection equipment. • Permits required (if applicable). • Protection and deflection tactics to be employed for each location. • List of resources (personnel and equipment) required. • Logistical arrangements (e.g. staging areas, accommodation, transport of personnel). • Timeframes to undertake deployment. • Access locations from land or sea. • Frequency of equipment inspections and maintenance (noting tidal cycles). • Waste management information, including logistical information on temporary storage areas, 	Operations Section Chief Planning Section Chief Environment Unit Leader	<input type="checkbox"/>

³¹ Where TRPs are unavailable for areas likely to be contacted, refer to other sources of information such as aerial photography, Oil Spill Response Atlas, Pilbara Region Oiled Wildlife Response Plan and WAMOPRA.

Action	Consideration	Responsibility	Complete	
		segregation, decontamination zones and disposal routes. <ul style="list-style-type: none"> No access and demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting/roosting areas and turtle nesting habitat (use existing roads and tracks first). Shift rotation requirements. 		
	Safety Officer to develop a safety plan for the activity with respect to potentially dangerous gases and VOCs (including applicable controls), including due regard to the Santos <i>Safe Work Practice (SWP): Site Entry Protocol in Oil Spill Response - Gas Monitoring</i>	Ambient gas testing during spills providing safe levels for operation of personnel and vessels	Operations Section Chief Safety Officer	<input type="checkbox"/>
	If required, identify vessels with relevant capabilities (e.g. shallow draft) for equipment deployment in consultation with the Control Agency.	Ensure vessels have shallow draft and/or a suitable tender (with adequate towing capacity and tie-points) if they are required to access shorelines.	Operations Section Chief Logistics Section Chief	<input type="checkbox"/>
	Deploy shoreline protection response teams to each shoreline location selected and implement response.	If passive recovery and/or non-oiled debris removal has been selected as a tactic, ensure deployment activities prioritise their implementation prior to hydrocarbon contact.	Operations Section Chief Shoreline Response Group Supervisor Deputy Division Commander (DTMI FOB) OSC	<input type="checkbox"/>
Ongoing Actions	Conduct daily re-evaluation of NEBA to assess varying net benefits and impacts of continuing to conduct shoreline protection and deflection activities.	-	Environment Unit Leader	<input type="checkbox"/>
	Report to the Operations Section Chief on the effectiveness of the tactics employed.	-	Shoreline Response Group Supervisor AMOSC Core Group Responder	<input type="checkbox"/>
	Response teams to conduct daily inspections and maintenance of equipment.	Shoreline protection efforts will be maintained through the forward operation(s) facilities set-up at mainland locations under direction of the Control Agency. Response crews will be rotated on a roster basis, with new personnel sourced on an as needs basis from existing HR suppliers.	Shoreline Response Group Supervisor Deputy Division Commander (DTMI FOB)	<input type="checkbox"/>

Table 14-3: Shoreline protection and deflection – resource capability

Equipment type/ Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
Santos owned nearshore boom/skimming equipment	Santos	Beach Guardian (25 m lengths) Total: 6	Varanus Island: 4 Exmouth: 2	Within 12 hours for deployment by vessel from Varanus Island.
		Zoom Boom (25 m lengths) Total: 13	Varanus Island: 8 Exmouth: 5	
		Desmi DBD16 brush skimmer Total: 2	Exmouth: 1 Varanus Island: 1	
AMSA nearshore boom/skimmer equipment	AMSA	Canadyne inflatable Total: 5	Karratha: 5	Access to National Plan equipment ³² through AMOSC ³³ . For mobilisation timeframes refer to Table 10-12.
		Structureflex inflatable Total: 25	Karratha: 10 Fremantle: 15	
		Versatech zoom inflatable Total – 18	Karratha: 5 Fremantle: 13	
		Slickbar – solid buoyancy Total: 2	Karratha: 2	
		Structureflex – solid buoyancy Total: 13	Karratha: 3 Fremantle: 10	
		Structureflex – land sea Total: 60	Karratha: 30 Fremantle: 30 Other locations around Australia	
AMOSC nearshore boom and skimming equipment.	AMOSC ³⁴	Beach Guardian Shoreseal boom (25 m lengths) Total: 87	Broome: 4 Exmouth: 20 Fremantle: 18 Geelong: 45	Response via duty officer within 15 minutes of first call; AMOSC personnel available within one hour of initial activation call. Equipment logistics varies according to stockpile location. For mobilisation timeframes refer to Table 10-12
		Zoom Boom (25 m lengths) Total: 184	Broome: 6 Exmouth: 19	

³² Updated AMSA equipment listings for locations around Australia can be found at the AMSA National Environmental Maritime Operations Portal: <https://www.amsa.gov.au/marine-environment/pollution-response/national-environmental-maritime-operations>

³³ Santos will enter a contractual arrangement with AMSA to access the National Plan resources.

³⁴ The latest AMOSC equipment listings are available through AMOSC Members Hub: <https://amosc.sharepoint.com/sites/HUB/SitePages/CollabHome.aspx>

Equipment type/ Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
			Fremantle: 30 Geelong: 129	
		Lamor HDB 1300 Boom (200 m) on reel Total: 2	Broome: 2	
		Lamor HDB 1500 Boom (100 m) on reel Total: 2	Fremantle: 1 Geelong: 1	
		Lamor HDB 1500 Boom (200 m) on reel Total: 1	Geelong: 1	
		Lamor SFB-18 GP Solid Flotation Curtain Boom (30 m lengths) Total: 58	Fremantle: 18 Geelong: 40	
		Minimax 12 brush skimmer Total: 5	Broome: 1 Exmouth: 1 Fremantle: 2 Geelong: 1	
		Komara 12k disc skimmer Total: 4	Exmouth: 1 Fremantle: 1 Geelong: 2	
		Komara 20k disc skimmer Total: 1	Fremantle: 1	
		Komara 30k disc skimmer Total: 2	Geelong: 2	
		Passive weir skimmer Total: 3	Exmouth: 1 Fremantle: 1 Geelong: 1	
		Desmi GT 185 brush/weir skimmer Total: 2	Exmouth: 1 Geelong: 1	
		Skimmer-Lamor Rock Cleaner Brush Total: 4	Fremantle: 2 Geelong: 2	
		Skimmer-Lamor LWS500 Brush/Weir skimmer Total: 6	Fremantle: 3 Geelong: 3	

Equipment type/ Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
		Desmi 250 weir skimmer Total: 1	Geelong: 1	
		Canadyne Multi Head Brush/Disc/Drum Total: 1	Geelong: 1	
		Versatech Multi Head Brush/Disc/Drum Total: 1	Geelong: 1	
		Egmopol barge with brush skimmer Total: 1	Geelong: 1	
Industry Mutual Aid nearshore boom and skimming equipment	Facilitated by AMOSC	Nearshore boom and skimmers	WA/NT	Access to Industry Mutual Aid through AMOSPlan and facilitated by AMOSC
OSRL nearshore boom/skimming equipment. Note: further booms are available and the listed items are shown as an example. Guaranteed access to 50% of stockpile by equipment type. Access to more than 50% on a case-by-case basis.	OSRL ³⁵	Air-skirt boom 10 m: 224 Air-skirt boom 20 m: 670 Air-skirt boom 200 m: 4 Beach sealing boom 10 m: 144 Beach sealing boom 15 m: 65 Beach sealing boom 20 m: 101 Inshore recovery skimmers: 128 Range of ancillaries to support above equipment.	OSRL global stockpiles at base locations: UK. Singapore. Bahrain. Fort Lauderdale.	Response from OSRL Duty Manager within 10 minutes. Equipment logistics varies according to stockpile location.
Personnel (field responders) for OSR strategies.	AMOSC Staff	Total: 12	Fremantle: 5 Geelong: 7	Response via Duty Officer within 15 minutes of first call. Timeframe for availability of AMOSC personnel dependent on location of spill and transport to site.
	AMOSC Core Group (Santos)	Total: 16	Perth/NW Australia facilities: 14 Port Bonython (South Australia): 2	From 24 hours <48 hours to WA locations
	AMOSC Core Group (Industry)	As per monthly availability	Office and facility locations across Australia.	Location dependent. Confirmed at time of activation.

³⁵ The latest OSRL equipment inventory available to members can be found in the SLA equipment stockpile status report: <https://www.osrl.com/in-action/publications/>.

Table 14-4: Shoreline protection and deflection – first-strike response timeline

Task	Time from shoreline contact (predicted or observed)
IMT confirms shoreline contact prediction, whether protection of shoreline sensitivities is required and begins sourcing resources.	<4 hours
Santos Core Group mobilised to the deployment port location.	<24 hours
Protection booming equipment mobilised to the deployment port location.	<24 hours
Waste storage equipment mobilised to the deployment port location.	<24 hours
Boom deployment vessel mobilised to the deployment port location.	<24 hours
AMOSOC Staff and Industry Core Group mobilised to the deployment port location.	24–48 hours
Protection/deflection operation deployed to the protection location.	60–72 hours (weather/daylight dependent)
Minimum Resource Requirements	
<p>Note: Resource requirements for protection and deflection will be situation/receptor specific. TRPs are held by Santos and DTMI, have been developed for various NWS locations and are available on the Santos ER Intranet Page. TRPs exist for most of the PPAs for this activity, further described in Section 6.5.1. Indicative first-strike resources for a single site protection area are:</p> <ul style="list-style-type: none"> • One small vessel suitable for boom deployment. • Shoreline (e.g. Beach Guardian) and nearshore booms (e.g. Zoom Boom) plus ancillary equipment (e.g. anchors, stakes) sufficient for protection of shoreline resource. • One skimmer appropriate for oil type(s). • Waste storage equipment. • One Protection and Deflection Team. • Personal protective equipment. 	

14.3 Worst-case Resourcing Requirements

Protection and deflection resourcing requirements have been determined from deterministic modelling results for the LOWC scenario. Deterministic run 33 resulted in the greatest length of shoreline oiled (refer to Table 6-5). This run resulted in 160 km of shoreline oiled at Ningaloo Coast North, with accumulation $\geq 100 \text{ g/m}^2$ occurring from day 49. The Southern Islands Coast (73 km), Middle Islands Coast (42 km) and Barrow Island (30 km) were also predicted to receive relatively long lengths of shoreline oiled at $\geq 100 \text{ g/m}^2$, albeit with longer times to contact than Ningaloo Coast North. Stochastic modelling predicted a worst case minimum time to contact for accumulated oil $\geq 100 \text{ g/m}^2$ of 23 days at Ningaloo Coast North. Neither the stochastic nor deterministic modelling predicted contact by floating oil $\geq 50 \text{ g/m}^2$ for any shoreline receptor, with the extent of floating oil $\geq 50 \text{ g/m}^2$ restricted to within 3 km of the release location. Therefore, shoreline protection and deflection is not likely to be an effective response strategy given the lack of floating oil available at response thresholds, however, it is retained as a secondary response strategy that may be deployed in the event of a spill subject to an operational NEBA.

Santos existing capability allows for mobilisation of protection and deflection resources (refer to Table 14-3) by day 2–3 if required (Table 14-4). The extended times to contact (the worst case minimum time to first contact for accumulated oil $\geq 100 \text{ g/m}^2$ predicted by the stochastic modelling is at Ningaloo Coast North on day 23) allows sufficient time to organise, mobilise and deploy protection and deflection personnel and equipment prior to hydrocarbon contact, guided by the ongoing monitoring and evaluation, and operational monitoring.

As a guide for worst-case shoreline protection and deflection resourcing, deterministic run 33 (the run resulting in the greatest length of shoreline accumulation $\geq 100 \text{ g/m}^2$) has been used to estimate the total number of protection and deflection teams that may be required (Table 14-5). Shoreline protection and deflection teams are assumed to be allocated approximately 10 km of shoreline per team, within which they will implement protection and deflection operations in close cooperation with the IMT planning section and as per the IAP.

Table 14-5: Estimated worst-case requirements for shoreline protection and deflection based on surface LOWC deterministic run 33

Receptor impacted	Minimum time to contact ≥ 100 g/m ²	Max. length of shoreline oil ≥ 100 g/m ² (km)	Max. accumulated volume of oil ashore ≥ 100 g/m ² (m ³)	Estimated no. of shoreline protection and deflection teams required
Ningaloo Coast North	49 days, 17 hours	160	1,012	16
Southern Islands Coast	49 days, 9 hours	73	257	8
Middle Islands Coast	52 days, 16 hours	42	81	5
Barrow Island	74 days, 9 hours	30	105	3
Northern Islands Coast	60 days, 16 hours	17	42	2
Thevenard Islands	51 days, 9 hours	14	42	2
Muiron Islands	49 days, 5 hours	13	55	2
Exmouth Gulf Coast	51 days, 7 hours	12	30	2
Montebello Islands	61 days, 11 hours	1	2	1
Total				41

Based on deterministic run 33, the worst-case personnel requirements for shoreline protection and deflection are for up to 41 teams. A typical shoreline protection and deflection team would consist of 12 personnel as a minimum, comprised of the following:

- 1 x Incident Commander/Site Supervisor
- 1 x Shallow draft vessel skipper
- 1 x Shallow draft vessel deckhand
- 9 x Protection and deflection operatives.

Although this involves a large number of teams, contact times are long (with the shortest contact time predicted as ~23 days by the stochastic modelling), allowing adequate time to plan and allocate these resources effectively. This assumes that all shorelines predicted to be contacted by the deterministic modelling will need a protection and deflection response. This is to demonstrate that Santos can scale up to the absolute worst-case scenario for shoreline contact, however in reality, protection and deflection response is likely to be far more targeted, guided by in-field monitoring of a spill incident and observed slick thickness and direction. The resourcing requirements will be determined based on feedback from SCAT activities, on operational NEBA, and in consultation with DTMI as the Control Agency. Shoreline effort will likely consist of a combination of protection and deflection, and shoreline clean-up (refer to Section 15.4), with resources often working together and/or in parallel.

Resource requirements for protection and deflection will be situation/receptor specific. TRPs are held by Santos and DTMI and are already in place for most of the PPAs (refer to Section 6.5.1).

14.4 Environmental Performance

Table 14-6 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 14-6: Environmental performance – shoreline protection and deflection

Environmental Performance Outcome	Implement shoreline protection and deflection tactics to reduce hydrocarbon contact with coastal protection priority areas.		
Response Strategy	Control Measures	Performance Standards [EPS-ID]	Measurement Criteria
Shoreline Protection and Deflection	Response Preparedness		
	Access to Santos protection and deflection equipment and personnel	[EPS-PD-001] Santos personnel and equipment stored and maintained / available as per Table 14-3.	Santos oil spill response team database; Santos equipment register; Exercise reports

Environmental Performance Outcome	Implement shoreline protection and deflection tactics to reduce hydrocarbon contact with coastal protection priority areas.		
Response Strategy	Control Measures	Performance Standards [EPS-ID]	Measurement Criteria
	Access to protection and deflection equipment and personnel	[EPS-PD-002] Maintenance of access to protection and deflection equipment and personnel through AMOSC, AMSA National Plan, OSRL and TRG throughout activity as per Table 14-3.	Access to National Plan resources through AMSA AMOSC Participating Member Contract OSRL Associate Member Contract TRG arrangements
	Protection and deflection small vessel providers for nearshore booming operations are identified	[EPS-PD-004] Maintenance of a list of small vessel providers operating in the North West Region that could be used for nearshore booming.	List of small vessel providers
	Response Implementation		
	First strike capability mobilised	[EPS-PD-005] First strike is mobilised in accordance with details and timings as specified in Table 14-4 unless directed otherwise by the Control Agency.	Incident log
	Just-in-time training provided for shoreline protection and deflection personnel	[EPS-PD-015] Training providers and personnel providers contacted during week 1 to initiate training of personnel required.	Incident log
	IMT and Control Agency to agree protection priorities	[EPS-PD-007] Santos IMT to confirm protection priorities in consultation with the Control Agency.	IAP; Incident log
	Prepare operational NEBA to determine if shoreline protection and deflection activities are likely to result in a net environmental benefit	[EPS-PD-008] Records indicate operational NEBA completed prior to shoreline protection and deflection activities commencing. Operational NEBA to be undertaken each operational period. Ensure NEBA considers waste management and the possibility of secondary contamination.	Operational NEBA; Incident log; IAP
	IAP Protection and Deflection Sub-plan is developed to ensure effective execution and environmental impacts from response are minimised	[EPS-PD-006] IAP Shoreline Protection and Deflection Sub-plan including shoreline/nearshore habitat/bathymetry assessment and waste management is developed to provide oversight and management of shoreline protection and deflection operation, prior to shoreline protection and deflection operations commencing.	Incident Log; IAP Shoreline Protection and Deflection Sub-plan
	Use of shallow draft vessels for shoreline and nearshore operations.	[EPS-PD-009] Shallow draft vessels are used for shoreline and nearshore operations, unless directed otherwise by the designated Control Agency.	Vessel specifications documented in IAP
	Conduct rapid shoreline/nearshore habitat/bathymetry assessment.	[EPS-PD-010] Unless directed otherwise by the designated Control Agency, a rapid shoreline/nearshore habitat/ bathymetry assessment is conducted prior to nearshore activities.	IAP records; Assessment records

15. Shoreline Clean-Up Plan

Table 15-1 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 15-1: Shoreline clean-up – environmental performance outcome, initiation criteria and termination criteria

Environmental Performance Outcome	Implement shoreline clean-up tactics to remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priority areas and facilitate habitat recovery	
Initiation criteria	<ul style="list-style-type: none"> Level 2 or Level 3 spills where shorelines with identified or potential protection priorities that will be, or have been, contacted NEBA indicates shoreline clean-up will benefit receptors Approval has been obtained from the Control Agency to initiate response strategy 	
Applicable hydrocarbons	MDO	Van Gogh Crude Oil
	X	✓1
Termination criteria	<ul style="list-style-type: none"> As directed by DTMI 	

15.1 Overview

Shoreline clean-up aims to remove hydrocarbons from shorelines and intertidal habitat to achieve a net environmental benefit. Removal of these hydrocarbons helps reduce remobilisation of hydrocarbons and contamination of wildlife, habitat and other sensitive receptors. Shoreline clean-up is often a lengthy and cyclical process, requiring regular shoreline clean-up assessments (North West Shelf OSM-BIP (7715-650-ERP-0002)) to monitor the effectiveness of clean-up activities and assess if they are resulting in any adverse impacts.

Shoreline clean-up is part of an integrated nearshore / shoreline response to be managed by the relevant Control Agency. Where Santos is not the Control Agency (refer to Table 4-2), it will undertake first-strike activations as required. In this circumstance, the relevant Control Agency will direct resources (equipment and personnel) provided by Santos for the purposes of shoreline clean-up. The information obtained from monitoring and evaluation tactics (refer to Section 10) and operational monitoring (Section 17), will be used by the IMT in the development of the operational NEBA to inform the most effective clean-up tactics (if any) to apply to individual sites. Intrusive shoreline clean-up techniques have the potential to damage sensitive shorelines. The appropriateness of clean-up tactics will be assessed against natural attenuation for sensitive sites. Selection of shoreline clean-up methods and controls to prevent further damage from the clean-up activities are to be undertaken in consultation with the Control Agency and selected based on NEBA.

Stochastic spill modelling for the worst-case LOWC scenario indicated that the greatest probability of shoreline oil accumulation $\geq 100 \text{ g/m}^2$ was predicted for Ningaloo Coast North (13.65%), Muiron Islands (9.99%), Montebello Islands (9.66%) and Barrow Island (8.33%) (refer to Table 6-3).

Shoreline clean-up techniques include:

- Shoreline clean-up assessment – uses assessment processes (refer to North West Shelf OSM-BIP [7715-650-ERP-0002]) to assess shoreline character and shoreline oiling and develop recommendations for response. Typically, this would be the first step in any shoreline clean-up response.
- Natural recovery – oiled shorelines are left untreated, and the oil naturally degrades over time.
- Manual and mechanical removal – removes oil and contaminated materials using machinery, hand tools, or a combination of both.
- Washing, flooding and flushing – uses water, steam, or sand to flush oil from impacted shoreline areas.
- Sediment reworking and surf washing – uses various methods to accelerate natural degradation of oil by manipulating the sediment.

15.2 Implementation Guidance

Table 15-2 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy.

Table 15-3 provides a list of resources that may be used to implement this strategy. Mobilisation times for the minimum resources that are required to commence initial shoreline clean-up operations, unless directed otherwise by the relevant Control Agency, are listed in Table 15-4. The OSC and/or Incident Commander of the Control Agency's IMT (once they assume control) is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 15-2: Implementation guidance – shoreline clean-up

Action	Consideration	Responsibility	Complete	
Initial Actions	Actions below are indicative only and are at the final determination of the Control Agency			
	Initiate Shoreline Clean-up Assessment (if not already activated).	Refer to North West Shelf OSM-BIP (7715-650-ERP-0002) for additional information. UAVs may be necessary for some sensitive environments and where personnel safety is at risk (e.g. dangerous fauna in remote locations).	Environment Unit Leader	<input type="checkbox"/>
	Using results from the Shoreline Clean-up Assessment, conduct an Operational NEBA to assess shoreline clean-up suitability and recommended tactics for each shoreline location.	SCATs are responsible for preparing field maps and forms detailing the area surveyed and make specific clean-up recommendations. The condition of affected shorelines will be constantly changing. Results of shoreline surveys should be reported as quickly as possible to the IMT to help inform real-time decision making. Engage a Heritage Adviser if spill response activities overlap with potential areas of cultural significance.	Environment Unit Leader	<input type="checkbox"/>
If the Operational NEBA supports shoreline clean-up, prepare a Shoreline Clean-up Plan for inclusion in the IAP.	Shoreline Clean-up Plan may include: <ul style="list-style-type: none"> • Clean-up objectives. • Clean-up end points (may be derived from the Shoreline Clean-up Assessment). • Clean-up priorities (may be derived from the Shoreline Clean-up Assessment). • Assessment and location of staging areas and worksites (including health and safety constraints, zoning). • Utility resource assessment and support (to be conducted if activity is of significant size in comparison to the size of the coastal community). • Permits required (if applicable). • Chain of command for on-site personnel. • List of resources (personnel, equipment, personal protective equipment (PPE)) required for selected clean-up tactics at each site. • Details of accommodation and transport management. • Security management. • Waste management information, including logistical information on temporary storage areas, segregation, decontamination zones and disposal routes. • Establish no access and demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting/roosting areas and turtle nesting habitat (use existing roads and tracks first). • Shift rotation requirements. 	Environment Unit Leader Planning Section Chief Operations Section Chief	<input type="checkbox"/>	

Action	Consideration	Responsibility	Complete	
	Refer to IPIECA guide: A Guide to Oiled Shoreline Clean-up Techniques (IPIECA-IOGP 2016b) for additional guidance on shoreline clean-up planning and implementation.			
	Safety Officer to develop a safety plan for the activity with respect to potentially dangerous gases and VOCs (including applicable controls), including due regard to the Santos <i>Safe Work Practice (SWP): Site Entry Protocol in Oil Spill Response - Gas Monitoring</i>	Ambient gas testing during spills providing safe levels for operation of personnel and vessels.	Operations Section Chief Safety Officer	<input type="checkbox"/>
	In consultation with the Control Agency, procure and mobilise resources to a designated port location for deployment, or directly to location via road transport.	-	Logistics Section Chief Supply Unit Leader Deputy Logistics Officer (DTMI IMT) Deputy Division Commander (DTMI FOB)	<input type="checkbox"/>
	Deploy SCAT teams to each shoreline location to begin operations under direction of the Control Agency.	Each clean-up team to be led by a Shoreline Response Team Leader, who could be an AMOSC Core Group Member or trained member of the AMSA administered National Response Team. Clean-up teams and equipment will be deployed and positioned as per observations by the SCATs and in consultation with the Control Agency. Team members will verify the effectiveness of clean-up, modifying guidelines as needed if conditions change.	Operations Section Chief SCAT Specialist / Coordinator Logistics Section Chief Deputy Logistics Officer (DTMI IMT)	<input type="checkbox"/>
Ongoing Actions	Shoreline Response Team Leader shall communicate daily reports to the IMT Operations Section Chief to inform of the effectiveness of existing tactics and any proposed tactics and required resources.	Where possible, maintain some consistency in personnel within Shoreline Response Teams. If the same personnel are involved in Shoreline Clean-up Assessment, they will be better placed to adapt their recommendations as the clean-up progresses and judge when the agreed end points have been met.	Shoreline Response Group Supervisor Operations Section Chief	<input type="checkbox"/>
	The IMT Operations Section Chief shall work with the Planning Section Chief to incorporate recommendations into the IAPs for the following operational period, and ensure all required resources are released and activated through the Supply Unit Leader and Logistics Section Chief.	-	Operations Section Chief Planning Section Chief Supply Unit Leader Logistics Section Chief	<input type="checkbox"/>
	Monitor progress of clean-up efforts and report to the Control Agency.	-	Operations Section Chief OSC Deputy Division Commander (DTMI FOB)	<input type="checkbox"/>

Table 15-3: Shoreline clean-up – resource capability

Equipment type / Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
Manual clean-up tools (shovels, rakes, wheelbarrows, bags, etc.)	AMOSC shoreline kits	Boom Accessories Beach Guardian Deployment Kit Total: 14	Fremantle: 2 Geelong: 8 Broome: 1 Exmouth: 3	Response via duty officer within 15 minutes of first call. AMOSC personnel available within one hour of initial activation call; equipment logistics varies according to stockpile location (Table 10-12)
		Shoreline support kit Total: 1	Fremantle: 1	
	Santos	Shoreline clean-up container	Varanus Island: 1	Within 12 hours for deployment from Varanus Island
	Hardware suppliers	As available	Karratha/ Exmouth/ Perth	-
Shoreline flushing (pumps/hoses)	AMOSC ³⁶	Shoreline flushing kit 3" Total: 2	Fremantle: 1 Geelong: 1	Response via duty officer within 15 minutes of first call. AMOSC personnel available within one hour of initial activation call. For mobilisation timeframes see Table 10-12.
		Shoreline flushing kit 4" Total: 1	Geelong: 1	
		Shoreline impact lance kit Total: 1	Geelong: 1	
Nearshore booms/ skimmers	AMOSC AMSA Industry Mutual Aid OSRL	Refer to Protection and Deflection (Table 14-3)	-	-
Decontamination/staging site equipment	AMOSC	Decontamination kit (PPE) Total: 2	Broome: 1 Exmouth: 1	Response via duty officer within 15 minutes of first call. AMOSC personnel available within one hour of initial activation call. For mobilisation timeframes see Table 10-12.
		PPE Response Container Total: 2	Fremantle: 1 Geelong: 1	
		Decontamination kit locker Total: 3	Exmouth: 1 Fremantle: 1 Geelong: 1	

³⁶ The latest AMOSC equipment listings are available through AMOSC Members Hub: <https://amosc.sharepoint.com/sites/HUB/SitePages/CollabHome.aspx>

Equipment type / Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
		Decontamination – vehicle washdown trailer Total: 2	Fremantle: 1 Geelong: 1	
		Decontamination – decon. support trailer Total: 1	Geelong: 1	
	AMSA	Decontamination station Total: 4	Karratha: 2 Fremantle: 2	Access to National Plan equipment ³⁷ through AMOSC ³⁸ .
	Oil spill equipment provider (e.g. Global Spill)	As available	Perth	Subject to availability
Waste storage (including temporary storage and waste skips and tanks for transport)	AMOSC temporary storage	Fast tanks (9,000 L and 3,000 L) Total: 8	Geelong: 4 Fremantle: 2 Exmouth: 2	Response via duty officer within 15 minutes of first call. AMOSC personnel available within one hour of initial activation call. For mobilisation timeframes see Table 10-12
		Vikotank (13,000 L) Total: 2	Broome: 1 Geelong: 1	
		Lamor (11,400 L) Total: 4	Fremantle: 4	
		IBCs (1 m ³) Total: 28	Exmouth: 10 Geelong: 18	
	AMSA temporary storage	Fast tanks (10 m ³) Total: 22	Darwin: 2 Karratha: 2 Fremantle: 4 Adelaide: 1 Brisbane: 2 Devonport: 2 Melbourne: 1 Sydney: 4 Townsville: 4	Access to National Plan equipment through AMOSC

³⁷ Updated AMSA equipment listings for locations around Australia can be found at the AMSA National Environmental Maritime Operations Portal: <https://www.amsa.gov.au/marine-environment/pollution-response/national-environmental-maritime-operations>

³⁸ Santos will enter a contractual arrangement with AMSA to access the National Plan resources.

Equipment type / Personnel required	Organisation	Equipment specifications / Total quantity available	Location / Quantity available	Mobilisation timeframe
		Structureflex (10 m ³) Total: 3	Brisbane: 1 Adelaide: 2	
		Vikoma (10 m ³) Total: 20	Darwin: 1 Adelaide: 1 Brisbane: 1 Devonport: 2 Fremantle: 7 Melbourne: 2 Sydney: 2 Townsville: 4	
	Santos Waste Management Service Provider	Refer to waste management (Section 18).	Perth, Karratha	
Personnel (field responders) for OSR strategies	AMOSC Staff	Total: 12	Fremantle: 5 Geelong: 7	Response via duty officer within 15 minutes of first call. Timeframe for availability of AMOSC personnel dependent on location of spill and transport to site.
	AMOSC Core Group (Santos)	Total: 16	Perth/NW Australia facilities: 14 Port Bonython (South Australia): 2	From 24 hours <48 to WA locations
	AMOSC Core Group (Industry)	As per monthly availability	Office and facility locations across Australia	Location dependent. Confirmed at time of activation.
	Santos contracted Work Force Hire company (e.g. Dare)	As per availability (up to 2,000)	Australia-wide	Subject to availability (indicatively 72+ hours)

Table 15-4: Shoreline clean-up – first-strike response timeline

Task	Time from shoreline contact (predicted or observed)
IMT confirms shoreline contact prediction, confirms applicability of strategy and begins sourcing resources.	<4 hours
Santos Core Group mobilised to deployment port location.	<24 hours
Clean-up equipment mobilised to deployment port location.	<48 hours
Waste storage equipment mobilised to deployment port location.	<24 hours
Remote island transfer vessel (if required) mobilised to deployment port location.	<24 hours
AMOSC Staff, Industry Core Group and Labour Hire mobilised to site/deployment port location.	<48 hours
Clean-up operation deployed to clean-up area under advice from Shoreline Assessment Team.	<60–72 hours (weather/daylight dependent)
Minimum Resource Requirements	
<p>Resource requirements for shoreline clean-up will be situation/receptor specific. If developed for the area/receptor, TRPs will outline suggested resource requirements and recommend shoreline assessments (as part of operational monitoring) be conducted prior to clean-up to confirm techniques. TRPs are held by Santos and DTMI. For further description on relevant TRPs for this activity, refer to Section 6.5.1. Indicative minimum requirements for one Santos activated shoreline clean-up team are:</p> <ul style="list-style-type: none"> • Manual clean-up/shoreline flushing equipment kit. • Waste storage (bags, temporary storage tanks, skips as appropriate). • Decontamination/staging equipment kit. • PPE. <p>One clean-up team comprises of:</p> <ul style="list-style-type: none"> • One team leader (AMOSC Staff, Industry Core Group or Santos Core Group). • 5³⁹ shoreline clean-up responders (AMOSC Core Group, Santos contracted labour hire personnel). 	

15.3 Shoreline Clean-up Resources

Shoreline clean-up equipment available for use by Santos is a combination of Santos owned, AMOSC, AMSA, DTMI and OSRL equipment as well as other industry resources available through the AMOSPlan mutual aid arrangements. Shoreline consumables are available through hardware, PPE and specialist oil/chemical spill suppliers and mobile plant equipment is available through hire outlets in Karratha, Broome, Perth and other regional centres. Where vessel deployments are required, Santos will leverage from existing contracted vessel providers in the first instance, and if required will source vessels from vendors that Santos already has a MSA with, or spot hiring vessels as needed. The Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001) contains the specifications for various types of vessels that may be required in an oil spill response, including vessels for shoreline clean-up support.

Shoreline clean-up personnel available to Santos is a combination of AMOSC Staff, AMOSC Core Group Responders (comprising AMOSC trained Santos and industry personnel), OSRL responders, State Response Team members and National Response Team members. Personnel for manual clean-up and mobile plant operations can be accessed through Santos' labour hire arrangements.

The level of deployment of equipment and personnel for clean-up will be commensurate to the spatial extent of shoreline contact, the volume of oil arriving and the sensitivity and access constraints of the shoreline in question. Deployment will be under the direction of the relevant Control Agency and the advice of shoreline clean-up specialists from AMOSC Core Group and National/State Response Teams. Shoreline clean-up assessments (refer to the North West Shelf OSM-BIP [7715-650-ERP-0002] and Appendix M) will provide information to guide the clean-up strategy and deployment of resources.

³⁹ Remote islands and ecologically sensitive locations may have reduced personnel numbers to reduce impacts from clean-up operations (refer to Section 15.4.2)

15.4 Worst-case Resourcing Requirements

Shoreline clean-up requirements have been determined for affected shorelines based on deterministic run 11 for the LOWC scenario given that this run results in the maximum volume of oil ashore of 1,728 m³ across all sensitive receptors at the ≥100g/m² threshold (refer to Table 6-5). The sensitive receptors predicted by the worst case deterministic modelling to receive the greatest accumulated oil ≥100 g/m² are presented in Table 15-5.

Based on the total potential waste generated and practicality in training and mobilising shoreline clean-up teams to remote/sensitive locations, up to 56 shoreline clean-up teams may be required from week 11. The estimated number of shoreline clean up teams and estimated time taken to clean up oil and oily waste from each sensitive receptor predicted to be contacted by shoreline accumulation ≥100 g/m² are provided in Table 15-5. It should be noted that many of these same teams will also conduct shoreline protection and deflection operations (refer to Section 14.3) prior to moving onto shoreline clean-up operations.

Resourcing requirements for shoreline clean-up operations have been conservatively determined based on a manual clean-up rate of 1 m³ of oily waste per person per day (6 m³ total per day, per team). A bulking factor of 10 has been applied to manual clean-up activities (IPIECA-IOGP, 2016c). The resourcing estimate considers:

- The size of a shoreline clean-up team for a remote/sensitive location (six persons, consisting of 1x Shoreline Clean-up Supervisor/Incident Commander and 5x operatives).
- The timeframe in which teams could achieve manual clean-up of all shorelines (Table 15-5).

Note that this does not include all possible spill scenarios and that a single spill may contact other receptors and at different volumes, as presented by the stochastic modelling results in Section 6.3. The information presented in Table 15-5 is to demonstrate that Santos can obtain the resources to scale up to the predicted worst-case shoreline accumulation volumes. In the event of an incident, Santos would use initial monitor and evaluate data (e.g. trajectory modelling and aerial surveillance) to determine where the available resources should be allocated for an effective clean-up response. The predicted earliest time to contact of 80 days for shoreline accumulation ≥100 g/m² for the worst case deterministic run for shoreline accumulation (run 11) provides sufficient time to plan for and resource a shoreline clean-up response targeting the remote sensitive receptors listed in Table 15-5. The shortest predicted contact time for shoreline accumulation ≥100 g/m² predicted by the stochastic modelling (23 days) also allows sufficient time for shoreline response planning. Santos has existing arrangements and capability in place to meet the staging, equipment and personnel requirements, including team leaders, through the resources described in Table 15-3 and in Appendix Q. The predicted extended time to contact by shoreline accumulation ≥100 g/m² also allow sufficient time to train additional team leaders if required. Shoreline effort will likely consist of a combination of protection and deflection (refer to Section 14.3), and shoreline clean-up, with resources often working together and/or in parallel.

Table 15-5: Estimated worst-case requirements for shoreline clean-up based on surface LOWC deterministic run 11

Receptor impacted	Minimum time to contact ≥100 g/m ²	Max. accumulated volume of oil ashore ≥100 g/m ²	Potential max. waste generated (m ³) – bulking factor of 10	Max. length of shoreline accumulation ≥100 g/m ²	Estimated no. of shoreline clean-up teams required	Estimated time taken to clean up
Ningaloo Coast North	80 d, 17 hrs	886 m ³	8,860	101 km	20	74 days
Southern Islands Coast	80 d, 10 hrs	631 m ³	6,310	95	20	53 days
Muiron Islands	80 d, 5 hrs	96 m ³	960	15	5	32 days
Exmouth Gulf Coast	82 d, 6 hrs	74 m ³	740	21	5	25 days
Middle Islands Coast	83 d, 9 hrs	28 m ³	280	20	3	16 days
Thevenard Islands	81 d, 16 hrs	11 m ³	110	6	2	10 days
Barrow Island	85 d, 21 hrs	2 m ³	20	1	1	4 days
Totals	-	1,728	17,280	-	56	-

15.4.1 Operational and Environmental Considerations affecting Resourcing

Along the Ningaloo Coast North receptor, the fringing reef and turtle nesting beaches are highly sensitive to disturbance, with access constrained by limited tracks and tidal windows (DCCEEW, 2009). At the Muiron Islands, steep beach profiles, exposed reef flats and restricted landing points make shoreline clean-up logistically challenging, while also increasing the risk of secondary impacts to turtle nesting sites (DoE 2006; CALM 2005). Exmouth Gulf shores support extensive mangroves and intertidal flats that are difficult to access and where intrusive clean-up methods could cause greater long-term damage than oiling itself (EPA 2022). The Southern Islands, Middle Islands and Thevenard Islands are remote cays and low-lying islands exposed to swell and tidal surges, with limited infrastructure for staging, storage or waste removal. Barrow Island has shallow bathymetry that results in large areas of exposed seabed at low tide and strong currents persist close to the islands (Chevron Australia 2014). In addition, much of the coastline is remote and inaccessible via road, making many shoreline clean-up techniques difficult and their use may result in greater environmental impacts. In addition, the remote nature, potential presence of dangerous fauna (i.e. saltwater crocodiles and Irukandji jellyfish) present significant safety risks to responders working in these environments.

Given the safety constraints and ecological sensitivities of these shorelines, shoreline clean-up operations in more sensitive locations should be conducted by smaller teams for a longer period of time. Methods such as intermittent manual treatment (<20 visits/month) and use of passive recovery booms are likely to be more effective and more practical than intrusive methods (e.g. intensive manual removal with large teams and >20 visits/month). Although this may take longer to undertake the clean-up, it is considered that the benefits outweigh the impacts as smaller teams are more targeted, recovering more oil and less sand and debris, reducing trampling of oil into the shore profile and minimising ecological impacts on the shorelines and their sensitive species.

The number of shoreline clean-up teams recommended to treat these shorelines is not based on extensive, intrusive and contiguous removal of oil and waste along all shorelines, but rather use of smaller teams and at lower frequency of visits. Where shoreline based manual removal is safe and deemed advantageous by SCATs and the Operational NEBA, this should be conducted via suitable vessels. However, it should be noted that it is generally not feasible to deploy shoreline clean-up teams on remote offshore intertidal reefs. Santos has considered the access limitations, safety issues and number of clean-up teams that may be able to operate in each of these environments.

In such environments as remote offshore intertidal reefs, natural recovery through wave washing is considered the least damaging and most effective technique for removing stranded oil (IPIECA-IOPG, 2016b; NOAA, 2010). Secondary techniques include booming and skimming floating oil before it strands on the reef and low pressure flushing from vessels using seawater. Santos has arrangements in place to access the equipment required to undertake these techniques (Table 15-3).

Although it may not be practicable to undertake manual shoreline clean-up, or deploy only a limited manual shoreline clean-up at these locations, the worst-case resourcing requirement for shoreline clean up personnel has been presented in Table 15-4, to show that Santos can access the required personnel if required.

15.4.2 Remote Island Deployment

For shoreline clean-up of remote islands, the following process could be implemented so as to minimise the secondary impacts of high numbers of spill response personnel on shorelines. If shoreline contact is predicted with locations where TRPs exist, the TRP will be used to assist with planning the deployment. Where TRPs are unavailable for areas likely to be contacted, refer to other sources of information such as aerial photography, Oil Spill Response Atlas, and WAMOPRA.

Vessels are to be mobilised to the designated deployment port to mobilise shoreline clean-up teams by water. The shoreline clean-up will be undertaken through on-water deployment to the defined shorelines in four stages:

1. Drop off six person clean-up containers (contents list in Appendix J) to shoreline contact locations defined by the IMT through observation data; or if locations are too sensitive to be used as staging sites, then transfer equipment via landing barge for offsite staging.
2. Deploy marine and environmental specialists to demarcate the clean-up zones with barrier posts and tape to prevent secondary impacts to flora and fauna by the clean-up teams.
3. Deploy clean-up teams in six person squads with a trained/competent shoreline responder as a Team Leader to conduct clean-up methods (flushing, bag and retrieve etc.), with all waste being bagged and stored in temporary storage areas lined with damp-proof coarse (DPC) grade HDPE sheeting above the high tide mark.
4. Deploy waste pickup landing barges to retrieve collected wastes from the temporary storage areas and to complete the shoreline clean-up and final polishing.

Multiple six person teams are to be used based on the actual volume of oil deposited, which will be determined via shoreline clean-up assessments (refer to the North West Shelf OSM-BIP [7715-650-ERP-0002]). These teams can

be resourced through the existing Santos arrangements, using a combination of personnel from OSROs for trained shoreline clean-up team leader roles and labour hire companies for clean-up team member roles.

15.5 Shoreline Clean-up Decision Guides

To assist with planning purposes, guidance for the selection of appropriate shoreline response strategies based on shoreline sensitivities is provided within Appendix K.

Operational guidelines for shoreline response activities including worksite preparation, manual and mechanical oil removal and vessel access for remote shorelines are included in Appendix L.

The WA DTMI Incident Management Plan – Marine Oil Pollution (WA DoT 2023b) also provides guidance on shoreline clean-up techniques.

15.6 Environmental Performance

Table 15-6 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 15-6: Environmental performance – shoreline clean-up

Environmental Performance Outcome	Implement shoreline clean-up tactics to remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priority areas and facilitate habitat recovery.		
Response Strategy	Control Measures	Performance Standards [EPS-ID]	Measurement Criteria
Shoreline Clean-Up	Response Preparedness		
	Access to shoreline clean-up equipment and personnel	[EPS-SCU-001] Access to shoreline clean-up equipment and personnel through AMOSC, AMSA National Plan, OSRL and TRG throughout activity.	Access to National Plan resources through AMSA AMOSC Participating Member Contract OSRL Associate Member Contract TRG Arrangements
	Access to Santos shoreline clean-up personnel	[EPS-SCU-002] Santos personnel available as per Table 15-3.	Santos oil spill response team database
	Access to vessels suitable for remote island transfers of equipment, personnel and waste	[EPS-SCU-005] MSAs with multiple vessel providers maintained throughout activity	MSAs with multiple vessel providers; Vessel details show suitability.
	Vessel requirements for offshore island shoreline clean-up operations are identified	[EPS-SCU-006] Maintenance of vessel specification for remote island shoreline clean-up operations.	Vessel specifications within Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)
	Access to shoreline clean-up labour hire personnel	[EPS-SCU-003] Maintenance of contract with labour hire provider.	Labour hire contract
	Onboarding procedure to access shoreline clean-up labour hire personnel	[EPS-SCU-004] Maintenance of an onboarding procedure for oil spill response labour hire	Onboarding procedure
	Response Implementation		
	First strike capability mobilised	[EPS-SCU-007] First strike is mobilised in accordance with details and timings as specified in Table 15-4 unless directed otherwise by the Control Agency.	Incident log

Environmental Performance Outcome	Implement shoreline clean-up tactics to remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priority areas and facilitate habitat recovery.		
Response Strategy	Control Measures	Performance Standards [EPS-ID]	Measurement Criteria
	Just-in-time training provided for shoreline clean-up personnel	[EPS-SCU-011] Training providers and personnel providers contacted during week 1 to initiate training of personnel required.	Incident log
	IMT and Control Agency to agree protection priorities	[EPS-SCU-012] Santos IMT to confirm protection priorities in consultation with the control agency.	IAP; Incident log
	Prepare operational NEBA to determine if shoreline clean-up activities are likely to result in a net environmental benefit	[EPS-SCU-013] Records indicate operational NEBA completed prior to shoreline activities commencing. Operational NEBA to be undertaken each operational period. Ensure NEBA considers waste management and the possibility of secondary contamination	Operational NEBA; Incident Log; IAP.
	IAP Shoreline Clean-up Sub-plan is developed to ensure effective execution and minimise environmental impacts from response	[EPS-SCU-015] IAP Shoreline Clean-up Sub-plan including waste management is developed to provide oversight and management of shoreline clean-up operation	Incident Log; IAP Shoreline Protection and Deflection Sub-plan
	Shoreline clean-up operations will be implemented under the direction of the Control Agency to ensure effective and coordinated execution	[EPS-SCU-008] Clean-up strategies will be implemented under the direction of the Control Agency. Santos will make resources available to the Control Agency.	Incident log
	Santos AMOSC core group responders available to the Control Agency for shoreline clean-up positions.	[EPS-SCU-016] Santos will make available AMOSC Core Group responders, or other appropriately trained responders, for shoreline clean-up team positions to the Control Agency.	Incident log
	Equipment for shoreline clean-up made available to the Control Agency from Santos, AMOSC and OSRL stockpiles	[EPS-SCU-017] Santos will make available to the Control Agency equipment from AMOSC and OSRL stockpiles.	Incident log
	Response requirements for extended operations	[EPS-SCU-010] If required mobilisation of the required number of shoreline teams throughout the release to meet the need specified in Section 15.4	Incident log
	NEBA included in development of following operational period IAP	[EPS-SCU-014] Effectiveness of shoreline clean-up to be evaluated by Team Leaders and reported to IMT for inclusion in NEBA. NEBA undertaken every operational period by the relevant Control Agency to determine if response strategy is having a net environmental benefit. NEBA included in development of following period Incident Action Plan	IAP; Incident log
	Access plans are developed to ensure effective execution and minimise environmental impacts from response	[EPS-SCU-018] Access plans for shoreline operations will be developed. Unless directed otherwise by the Control Agency, Access plans will prioritise use of existing roads and tracks, establish demarcation zones to protect sensitive areas and select vehicles appropriate to conditions	IAP demonstrates requirement is met

Environmental Performance Outcome	Implement shoreline clean-up tactics to remove stranded hydrocarbons from shorelines in order to reduce impact on coastal protection priority areas and facilitate habitat recovery.		
Response Strategy	Control Measures	Performance Standards [EPS-ID]	Measurement Criteria
	Soil profile assessment is undertaken prior to earthworks to ensure effective execution and minimise environmental impacts from response	[EPS-SCU-020] Unless directed otherwise by the designated Control Agency, a soil profile assessment is conducted prior to earthworks.	Soil Profile Assessment; IAP; Incident log
	Pre-cleaning and inspection of equipment (quarantine) is undertaken to minimise environmental impacts from response on offshore islands	[EPS-SCU-021] Vehicles and equipment provided by Santos are verified as clean and invasive species free prior to deployment to offshore islands.	Quarantine documentation; IAP; Incident log
	If spill response activities overlap with potential areas of cultural significance, a Heritage Advisor will be engaged	[EPS-SCU-022] In consultation with the Control Agency, engage a Heritage Advisor to provide advice on any sites of cultural significance that may be affected directly by the spill, or indirectly through implementation of spill response measures.	Documented in IAP; Incident log
	Select forward staging areas in consultation with the Control Agency	[EPS-SCU-023] Any establishment of forward staging areas at shorelines is done under the direction or in consultation with the Control Agency.	Incident log; IAP
	Establish demarcation zones in sensitive areas	[EPS-SCU-024] Unless directed otherwise by the designated Control Agency, demarcation zones are mapped out in sensitive habitat areas for vehicle and personnel movement, considering sensitive vegetation, bird nesting/ roosting areas and turtle nesting habitat.	IAP demonstrates requirement is met
	Operational restrictions of vehicle and personnel movement are established to limit erosion and compaction	[EPS-SCU-019] Unless directed otherwise by the designated Control Agency, operational restrictions on movement of personnel and vehicles, including vehicle types and traffic volumes, are established to minimise impacts from erosion and compaction	IAP demonstrates requirement is met
	Stakeholder consultation for deployments in coastal areas	[EPS-SCU-025] Consultation is undertaken with relevant stakeholders prior to deployment of resources to townships and marine/coastal areas.	Consultation records

16. Oiled Wildlife

The WA DTMI is the Control Agency and DBCA is the Jurisdictional Authority and lead agency for oiled wildlife response within WA State waters. Santos and AMSA are the Control Agencies for oiled wildlife response within Commonwealth waters from facility and vessel spills respectively. Table 16-1 provides the environmental performance outcome, initiation criteria and termination criteria for this strategy.

Table 16-1: Oiled wildlife response – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Implement tactics in accordance with Santos Oiled Wildlife Response Framework Plan (7700-650-ERP-0017) to prevent or reduce impacts, and to humanely treat, house, release or euthanise wildlife.	
Initiation criteria	Monitor and evaluate information and/or operational monitoring data shows that wildlife are contacted, or are predicted to be contacted, by a spill.	
Applicable hydrocarbons	MDO	Van Gogh Crude
	✓1	✓1
Termination criteria	<ul style="list-style-type: none"> Oiling of wildlife has not been observed over a 48-hour period. Oiled wildlife has been successfully rehabilitated. Agreement is reached with Jurisdictional Authorities and stakeholders to terminate the response. 	

16.1 Overview

The short-term effects of hydrocarbons on wildlife may be direct such as the external impacts from coating or internal effects from ingestion and inhalation. OWR includes wildlife surveillance/reconnaissance, wildlife hazing, pre-emptive capture and the capture, cleaning, treatment and rehabilitation of animals that have been oiled. In addition, it includes the collection, post-mortem examination, and disposal of deceased animals that are found in the vicinity of an oil spill or are reasonable suspected of have succumbed to the effects of oiling.

Long-term effects of a spill on wildlife may be associated with loss/degradation of habitat and impacts to food sources and reproduction. An assessment of such impacts is covered in Section 7.2 and Section 7.3 of the EP and post-spill via scientific monitoring (Section 17).

Table 16-2 provides guidance on the designated Control Agency and Jurisdictional Authority for OWR in Commonwealth and State waters. For a petroleum activity spill in Commonwealth waters, Santos acts as the Control Agency and will be responsible for the wildlife response. The Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) will be referred to for guidance in coordinating an OWR when Santos is the Control Agency and for the

The key plan for OWR in WA is the WAOWRP (DBCA, 2022a). The WAOWRP establishes the framework for preparing and responding to potential or actual wildlife impacts during a OWR first-strike response; otherwise, the relevant State OWR Plan will be referred to, as described below. spill and sets out the management arrangements for implementing an OWR in conjunction with the SHP-MEE. It is the responsibility of DBCA to administer the WAOWRP under the direction of the DTMI (Table 16-2).The Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) is consistent with and interfaces the WAOWRP and the WA Oiled Wildlife Response Manual (WA OWR Manual) (DBCA, 2022b).

If a spill occurs in WA State waters or enters State waters, DBCA is the Jurisdictional Authority for wildlife, and for Level 2/3 spills, will also lead the oiled wildlife response under the control of the DTMI. DBCA is the State Government agency responsible for administering the Biodiversity Conservation Act 2016, which has provisions for authorising activities that affect wildlife.

For Level 1 spills in State waters, Santos will be the Control Agency, including for wildlife response. It is, however, an expectation that for Level 2/3 petroleum activity spills, Santos will conduct the initial first-strike response actions for wildlife and continue to manage those operations until DBCA is activated as the lead agency for wildlife response and formal handover occurs. Following formal handover, Santos will function as a support organisation for the OWR and will be expected to continue to provide planning and resources as required.

Table 16-2: Jurisdictional and Control Agencies for oiled wildlife response

Jurisdictional boundary	Spill source	Jurisdictional Authority for OWR	Control Agency		Relevant documentation
			Level 1	Level 2/3	
Commonwealth waters (3 - 200 nautical miles from territorial/state sea baseline)	Vessel	DCCEEW	AMSA		WAOWRP WA OWR Manual Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017)
	Petroleum activities		Titleholder		
WA State waters (State waters to three nautical miles and some areas around offshore atolls and islands)	Vessel	DBCA	WA DTMI ⁴⁰		
	Petroleum activities		Titleholder	WA DTMI	
International waters	Vessel	Relevant foreign authority	Santos will liaise with DFAT in the event that an oil spill may enter international waters. Santos will work with DFAT and the respective governments to support response operations.		
	Petroleum activities				

16.2 Wildlife Priority Protection Areas

For planning purposes, determination of wildlife PPAs is based on stochastic modelling of the worst-case spill scenarios, the known presence of wildlife and in consideration of the following:

- Presence of high densities of wildlife, threatened species and/or endemic species with high site fidelity.
- Greatest probability and level of contact from floating oil and/or shoreline accumulation.
- Shortest timeframe to contact.

The wildlife PPAs for VGA-4H GI ST1 well suspension / decommissioning activities are outlined in Table 16-3 and align with the PPAs for spill response described in Section 6.4. Further detail on the conservation status of relevant species is outlined in the EP. Also refer to Appendix B of the North West Shelf OSM-BIP for background information on species at these locations, including any known key locations and seasonality.

Depending on the timing of a potential hydrocarbon spill, certain species could be more impacted because of key seasonal biological activities such as breeding, mating, nesting, hatching or migrating. Table 16-4 provides further detail of key wildlife activities in the Pilbara/Kimberley regions and the corresponding time of year.

Table 16-3: Wildlife PPAs

Wildlife Priority Protection Area	Key Locations	Fauna Type
Barrow Island	Western side of Barrow Island – green turtles Eastern side of Barrow Island – flatback turtles Turtle Bay north beach, North and west coasts and John Wayne Beach – loggerhead and hawksbill turtle nesting	<ul style="list-style-type: none"> • Regionally and nationally significant turtle populations: <ul style="list-style-type: none"> – Green turtle (<i>Chelonia mydas</i>) (western side beaches) – Flatback turtle (<i>Natator depressus</i>) (eastern side nesting beaches) – Loggerhead turtle (<i>Caretta caretta</i>) and hawksbill turtle (<i>Eretmochelys imbricata</i>) (Turtle Bay north beach, North and west coasts- John Wayne Beach).
	Double Islands – migratory birds Bandicoot Bay and widespread on Barrow Island – migratory birds	<ul style="list-style-type: none"> • Migratory birds (important habitat): <ul style="list-style-type: none"> – 10th of top 147 bird sites – Highest population of migratory birds on Barrow Island Nature Reserve (south-south-east of the Island) • Double Island has important bird nesting habitat (shearwaters [<i>Puffinus sp.</i>] and sea eagles [<i>Haliaeetus sp.</i>])
Lowendal Islands	All beaches on Beacon, Bridled, Varanus, Abutilon, Parakeelya Islands	<ul style="list-style-type: none"> • Seabird nesting all year, peak Oct – Jan. • Significant flatback turtle (<i>Natator depressus</i>) rookery, nesting season for flatback turtles peaks Dec - Jan

⁴⁰ If an OWR is required in WA State waters, the DBCA is responsible for the administration of the WAOWRP under the direction of the DTMI.

Wildlife Priority Protection Area	Key Locations	Fauna Type
	Surrounding waters	<ul style="list-style-type: none"> Dugongs (<i>Dugong dugon</i>)
	Abutilon, Beacon, Bridled, Parakeelya, and Varanus islands	<ul style="list-style-type: none"> Diverse avifauna comprising of approximately 89 species Seabirds nesting: wedge-tailed shearwater (<i>Puffinus pacificus</i>), bridled tern (<i>Onychoprion anaethetus</i>), crested tern (<i>Thalasseus bergii</i>), lesser crested terns (<i>T. bengalensis</i>) and silver gull (<i>Chroicocephalus novaehollandiae</i>) Regularly supports 1% of the world population of crested and bridled terns Estimated breeding pairs during 2023-24 seabird monitoring programme: <ul style="list-style-type: none"> Few breeding pairs of any species observed on Varanus Island, thought to be due to weather conditions from tropical cyclone Olga in early April 2024. 5,639 breeding pairs of bridled tern on Parakeelya Island, 4,071 on Bridled Island and 2,335 on Abutilon Island 570 breeding pairs of crested tern on Beacon Island.
Montebello Islands	Northwest and Eastern Trimouille Islands – hawksbill turtle Western Reef and Southern Bay at Northwest Island – green turtle	<ul style="list-style-type: none"> Turtles nesting– significant green turtle (<i>Chelonia mydas</i>) nesting; hawksbill (<i>Eretmochelys imbricata</i>), loggerhead (<i>Caretta caretta</i>) and flatback (<i>Natator depressus</i>) turtles Turtle nesting and breeding Nov to Mar with peak in late Dec/early Jan
	Surrounding waters	<ul style="list-style-type: none"> Pygmy blue whale (<i>Balaenoptera musculus brevicauda</i>) migration area (Apr to Aug) Humpback whale (<i>Megaptera novaeangliae</i>) migration area (peak migration Jun to Aug) Dugong (<i>Dugong dugon</i>) foraging areas Migratory and threatened seabirds: <ul style="list-style-type: none"> at least 14 species Significant nesting (Sep to Feb), foraging and resting areas
Muiron Islands	South Island - Loggerhead turtle	<ul style="list-style-type: none"> Major loggerhead turtle (<i>Caretta caretta</i>) nesting site, significant green turtle (<i>Chelonia mydas</i>) nesting site, low density hawksbill turtle (<i>Eretmochelys imbricata</i>) nesting site, occasional flatback turtle (<i>Natator depressus</i>) presence
	-	<ul style="list-style-type: none"> Seabird nesting: Wedge-tailed shearwater (<i>Ardenna pacifica</i>) nesting colony, birds forage at sea in large aggregations. Crested tern (<i>Thalasseus bergii</i>) nesting colony. Humpback whale (<i>Megaptera novaeangliae</i>) migration
Ningaloo Coast North	North Mauds Landing, south of Point Cloates, Mandu Creek to Yardie Creek, Jurabi point, Gnarraloo Bay and Cape Farquhar	<ul style="list-style-type: none"> Loggerhead (<i>Caretta caretta</i>), green (<i>Chelonia mydas</i>), and hawksbill (<i>Eretmochelys imbricata</i>) turtle Turtle nesting and breeding Nov to Mar with peak in late Dec/ early Jan
	Main breeding areas at Mangrove Bay, Mangrove Point, Point Maud, the Mildura wreck site and Fraser Island	<ul style="list-style-type: none"> 33 species of seabird and avifauna, including Eastern Curlew (<i>Numenius madagascariensis</i>) Seabird nesting Sep to Feb
	-	<ul style="list-style-type: none"> Pygmy blue whales (<i>Balaenoptera musculus brevicauda</i>) (foraging area) <ul style="list-style-type: none"> Migration: Apr to Aug Dugongs (<i>Dugong dugon</i>) (Marine/migratory) (breeding and foraging) Seasonal aggregations of whale sharks (<i>Rhincodon typus</i>) (Mar to Jul) and manta rays

Wildlife Priority Protection Area	Key Locations	Fauna Type
Northern Islands Coast	-	<ul style="list-style-type: none"> Turtle nesting and breeding sites in many of the islands in this region. Seabird nesting, including pelican (<i>Pelecanus sp.</i>), wedgetailed shearwater (<i>Puffinus pacificus</i>) and pied cormorant (<i>Phalacrocorax varius</i>). Seagrass beds surrounding many small islands, including Regnard Islands, likely to support foraging dugongs (<i>Dugong dugon</i>).

Table 16-4: Key wildlife activities in the Pilbara and Kimberley regions and corresponding time of year

Wildlife Type	Activity	Period
Humpback whales	Migration pathway to and from Kimberley calving grounds.	Peak between June and August
Pygmy blue whales	Foraging and migration pathway along the Western Australian shelf break	Apr-Dec
Dugong	Breeding Mating	Mar–Aug Aug–Mar
Marine turtles	Foraging	September to December January to April
Shorebirds	Migratory pathway stopover	September to April

16.3 Magnitude of Wildlife Impact

Given the distribution and behaviour of wildlife in the marine environment, a spill which only impacts Commonwealth offshore waters is likely to result in limited opportunities to rescue wildlife. In such instances, continued wildlife reconnaissance, carcass recovery, sampling of carcasses that cannot be retrieved and scientific monitoring are more likely to be the focus of response efforts. In contrast, a spill which results in shoreline.

The stochastic modelling for the worst-case LOWC spill scenario for the VGA-4H GI ST1 well suspension / decommissioning activities predicts that the greatest accumulation of oil will occur at Ningaloo Coast North (refer to Section 6.3.1) (RPS 2025). Using the WAOWRP (DBCA, 2022a) Guide for Rating the Wildlife Impact of an Oil Spill (Table 16-5) and stochastic modelling for the worst-case spill scenarios (Section 6.3), it is predicted that high wildlife impacts have the potential to occur as a result of a worst-case spill scenario associated with this activity.

Table 16-5: WAOWRP Guide for rating the wildlife impact of an oil spill

Wildlife Impact Rating	Low	Medium	High
What is the likely duration of the wildlife response?	<3 days	3-10 days	>10 days
What is the likely total intake of animals?	<10	11-25	>25
What is the likely daily intake of animals?	0-2	2-5	>5
Are threatened species, or species protected by treaty, likely to be impacted, either directly or by pollution of habitat or breeding areas?	No	Yes – possible	Yes – likely
Is there likely to be a requirement for building primary care facility for treatment, cleaning and rehabilitation?	No	Yes – possible	Yes – likely

16.4 Implementation Guidance

Refer to Section 6 of the Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) for guidance on the tasks and responsibilities that should be considered when implementing an OWR with Santos as the Control Agency or prior to formal hand over to the relevant Control Agency. The implementation guidance within the Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) includes:

- Record keeping
- Situational awareness
- Activation of Santos IMT Wildlife Branch

- Notifications
- Santos Oiled Wildlife Rapid Assessment Teams (RATs)
- Wildlife reconnaissance
- Santos Oiled Wildlife Sample Collection Protocol
- Mobilisation of required resources
- Handover to external Control Agency (if relevant).

The OWR first strike plan will focus on notifications, wildlife reconnaissance and response preparation (refer to Section 6.1 of the Santos Oiled Wildlife Response Framework Plan [7700-650-PLA-0017]). Refer to Table 16-6 for an indicative timeframe and Appendix P for resource capability. Preventative actions, such as hazing, along with capture, intake and treatment require a higher degree of planning, approval (licences) and skills and will be planned for and carried out under the wildlife portion of the IAP (refer to Section 6.2 of the Santos Oiled Wildlife Response Framework Plan [7700-650-PLA-0017]).

Due to the remote offshore reef locations potentially impacted in the event of a worst-case LOWC event (for example, Imperieuse Reef and Clerke Reef), there are additional logistical constraints that may need to be considered for implementing an OWR in these areas; these are presented in Table P-2 of Appendix P. The Santos Marine Vessel Requirements for Oil Spill Response document (7710-650-ERP-0001) also highlights the potential need for sourcing of vessels to serve as an OWR field station and provides the broad specification of such vessels. This information assists the IMT in the sourcing of appropriate vessels through the existing MSAs that Santos has with various vessel providers.

Table 16-6: Oiled wildlife response – first-strike response timeline

Task	Time from oiled wildlife contact (predicted or observed)
IMT notifies regulatory authorities and AMOSC of oiled wildlife/potential for contact.	<2 hours
Mobilise Santos personnel for oiled wildlife reconnaissance (this will be already occurring through aerial observer mobilisation).	<24 hours
Mobilisation of AMOSC oiled wildlife equipment and industry OWR Team to forward staging area.	<48 hours
Minimum resource requirements	
<p>The requirements for oiled wildlife response will be situation specific and dependent upon reconnaissance reports.</p> <p>First strike resources:</p> <ul style="list-style-type: none"> • Reconnaissance platforms (refer to Santos Oiled Wildlife Response Framework Plan [7700-650-PLA-0017] and Appendix P). • 6x trained industry OWR Team personnel (AMOSC staff and contractors/AMOSC Industry OWR Group). • Additional resources: • Refer to Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017). • Refer to Appendix P for information on OWR capability and equipment. 	

16.5 Environmental Performance

Table 16 7 indicates the environmental performance outcomes, controls and performance standards for this response strategy.

Table 16-7: Environmental performance – oiled wildlife response

Environmental performance outcome	Implement tactics in accordance with Santos Oil Wildlife Response Framework Plan (7700-650-PLA-0017) to prevent or reduce impacts, and to humanely treat, house, and release or euthanise wildlife.		
Response strategy	Control measures	Performance standards [EPS-ID]	Measurement criteria
Oiled wildlife response	Response preparedness		
	Access to oiled wildlife response equipment and personnel.	[EPS-OWR-001] Access to oiled wildlife response equipment and personnel through Santos, AMOSC, AMSA National Plan and OSRL maintained throughout activity.	Access to National Plan resources through AMSA AMOSC Participating Member Contract OSRL Associate Member Contract
	Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) in place	[EPS-OWR-005] Santos Oiled Wildlife Response Framework Plan provides guidance for coordinating an OWR when Santos is the Control Agency and outlines Santos' response arrangements.	Santos Oiled Wildlife Response Framework Plan; Revision records.
	Access to labour hire personnel	[EPS-OWR-003] Maintenance of contract with labour hire provider.	Labour hire contract
	Labour hire onboarding procedure to access labour hire personnel	[EPS-OWR-004] Maintenance of an onboarding procedure for oil spill response labour hire.	Onboarding procedure
	Access to Santos trained oiled wildlife response personnel	[EPS-OWR-002] Maintain Santos personnel trained on OWR and positioned at Perth and VI	Training records
	Vessel specifications for an OWR field station in place	[EPS-OWR-014] Vessel specifications for an OWR field station included within planning documentation.	Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)
	Response implementation		
	First strike capability mobilised	[EPS-OWR-006] First strike is mobilised in accordance with details and timings as specified in Table 16-6 unless directed otherwise by relevant Control Agency.	Incident log
	OWR Management	[EPS-OWR-007] OWR managed in accordance with the Santos Oiled Wildlife Framework Plan (7700-650-PLA-0017)	Incident log
	Prepare operational NEBA prior to operations commencing	[EPS-OWR-008] Prepare operational NEBA to determine magnitude of wildlife impact and determine if OWR activities are likely to result in a net environmental benefit (particularly in relation to hazing and pre-emptive capture). Operational NEBA to be undertaken each operational period.	IAP; Incident log
	IAP Oiled Wildlife Response Sub-plan developed, including waste management, to provide oversight	[EPS-OWR-009] IAP Oiled Wildlife Response Sub-plan is developed to ensure effective, coordinated	Incident log indicates IAP Oiled Wildlife Response Sub-plan prepared prior to

Environmental performance outcome	Implement tactics in accordance with Santos Oil Wildlife Response Framework Plan (7700-650-PLA-0017) to prevent or reduce impacts, and to humanely treat, house, and release or euthanise wildlife.		
Response strategy	Control measures	Performance standards [EPS-ID]	Measurement criteria
	and management of OWR operations	execution with the Santos Oiled Wildlife Framework Plan (7700-650-PLA-0017) and minimise environmental impacts from response.	oiled wildlife response operations commencing
	Oiled Wildlife Sample Collection Protocol	[EPS-OWR-010] Oiled wildlife sample collection carried out in accordance with the Santos Oiled Wildlife Sample Collection Protocol.	Incident log

17. Operational and Scientific Monitoring

OSM is a key component of the environmental management document framework for offshore petroleum activities, which includes activity EPs and OPEPs. Operational monitoring is instrumental in providing situational awareness of a hydrocarbon spill, enabling the IMT to mount a timely and effective spill response and continually monitor the effectiveness of the response. Scientific monitoring is also the principal tool for determining the extent, severity and persistence of environmental impacts from a hydrocarbon spill and for informing resultant remediation activities.

Santos has developed a North West Shelf Operational and Scientific Monitoring Bridging Implementation Plan (OSM-BIP) (7715-650-ERP-0002) which describes a program of monitoring oil pollution that will be adopted in the event of a hydrocarbon spill incident (Level 2–3) to marine waters. It aligns with the [Joint Industry Operational and Scientific Monitoring Framework](#) (APPEA, 2021) and describes how this Framework applies to Santos activities and spill risks for the geographic extent of North West Shelf OSM-BIP (7715-650-ERP-0002). The relationship between the Joint Industry OSM Framework and Santos environmental management framework is illustrated in Figure 17-1.

The Santos OSM-BIPs can be found on the [Santos ER SharePoint site](#).

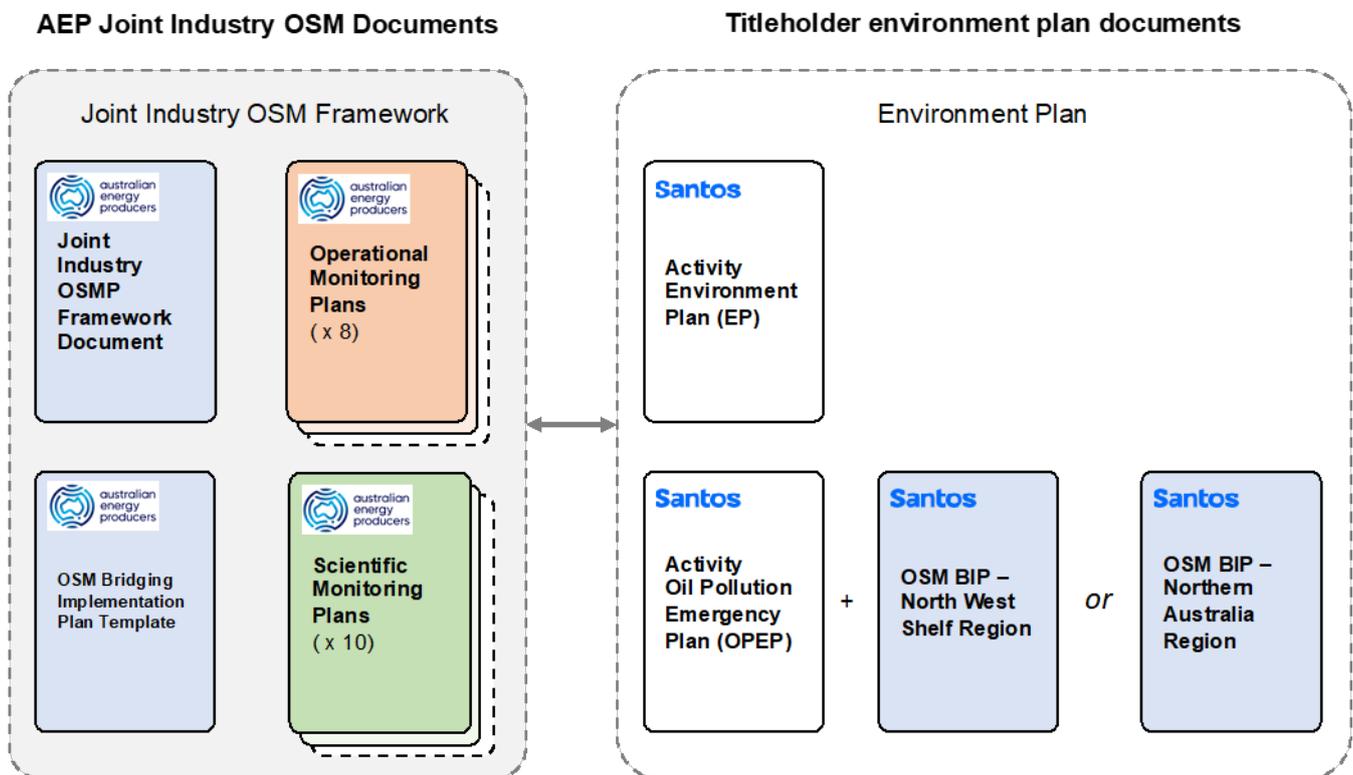


Figure 17-1: Relationship of Joint Industry and Titleholder OSM Documentation

The North West Shelf OSM-BIP is structured so that it can provide a flexible framework that can be adapted to individual spill incidents. A series of Operational Monitoring Plans (OMPs) and Scientific Monitoring Plans (SMPs) form part of the Joint Industry OSM Framework and provide detail on monitoring design, standard operating procedures, data management, quality assurance and quality control and reporting.

There are two types of monitoring that would occur following a Level 2–3 spill event:

- Operational Monitoring** – which is undertaken during the course of the spill and includes any physical, chemical and biological assessments that may guide operational decisions such as selecting the appropriate response and mitigation methods and / or to determine when to terminate a response activity. This monitoring is additional to the activities (aerial/vessel surveillance, tracking buoys, oil spill trajectory modelling and satellite tracking) performed as part of the Monitor and Evaluate Strategy (Section 10). The design of operational monitoring requires judgements to be made about scope, methods, data inputs and outputs that are specific to the individual spill incident, balancing the operational needs of the response with the logistical and time constraints of gathering and processing information. Information needs to be collected and processed rapidly to suit response needs, with a lower level of sampling and accuracy needed than for scientific purposes. For details on initiation and termination criteria for OMPs refer to the North West Shelf OSM-BIP (7715-650-ERP-0002).

- Scientific Monitoring** – which can extend beyond the termination of response operations. Scientific monitoring has objectives relating to attributing cause-effect interactions of the spill or associated response with changes to the surrounding environment. SM will be conducted on a wider study area, extending beyond the spill footprint, will be more systematic and quantitative, and aim to account for natural or sampling variation. For further details on the SMPs refer to the North West Shelf OSM-BIP (7715-650-ERP-0002).

Table 17-1 lists the Joint Industry OMPs and SMPs that are relevant to Santos' VGA-4H GI ST1 well suspension / decommissioning activities. Santos confirms that it has reviewed the aims and objectives of these relevant OMPs and SMPs, and determined that they are appropriate to meet the monitoring requirements of this activity, addressing potential impacts, risks and response activities.

The North West Shelf OSM-BIP (7715-650-ERP-0002) is tailored to Santos' activities on the north west shelf. It includes details on priority locations for monitoring, resourcing requirements; and operational guidance including logistics, mobilisation and permitting; with the exception of capability requirements for OM6: Shoreline Clean-up Assessment; these are typically assessed for each activity, according to deterministic modelling for the worst-case scenario that shows the simulation with the longest length of shoreline contacted, as this criterion influences the number of assessment teams required. The capability assessment for the remaining OMPs and SMPs is assessed against different deterministic modelling criteria, as described in the North West Shelf OSM-BIP (7715-650-ERP-0002). Resourcing requirements for OM6: Shoreline Clean-up Assessment for VGA-4H GI ST1 well suspension / decommissioning activity are provided in Appendix M.

In summary, Santos assessed the worst-case spill scenario for OSM capability as the scenario predicted to contact the greatest number of receptors at the low hydrocarbon thresholds for floating, shoreline or dissolved hydrocarbon contact within 7 days; followed by the greatest number of receptors contacted within 7-14 days; and at the highest contact probabilities. If a receptor is only contacted by low concentrations of entrained hydrocarbons and not by any other hydrocarbon phase, it will be considered a lower priority during the initial monitoring response as outlined in Section 2.2 of the North West Shelf OSM-BIP (7715-650-ERP-0002). Santos confirms that all of the VGA-4H GI ST1 well suspension / decommissioning activities spill scenarios (refer to Section 6.1) fit within the OSM consolidated Scientific Monitoring Planning Area and assessment criteria defined within Appendix B of the North West Shelf OSM-BIP (7715-650-ERP-0002). This assessment is detailed in Appendix N.

Santos will review the initiation criteria for OMPs and SMPs (Provided in Table 9-1 (OMPs) and Table 9-2 (SMPs) of the Joint Industry Operational and Scientific Monitoring Framework [APPEA, 2021]) when preparing the initial IAPs, and subsequent IAPs. If any initiation criteria are met, then that relevant OMP and/or SMP will be activated via the OSM Services Provider.

Table 17-1: Joint Industry OSM Plans relevant to VGA-4H GI ST1 Well Suspension / Decommissioning Activity

Operational monitoring	Relevant for NV G1 Well Suspension / Decommissioning Activity	Scientific Monitoring	Relevant for VGA-4H GI ST1 Well Suspension / Decommissioning Activity
OM1: Hydrocarbon Characterisation	✓	SM1: Water Quality Impact Assessment	✓
OM2: Hydrocarbon in water assessment	✓	SM2: Sediment Quality Impact Assessment	✓
OM3: Hydrocarbon in sediment assessment	✓	SM3: Intertidal and Coastal Habitat Assessment	✓
OM4a: Surface dispersant effectiveness monitoring	✓	SM4: Seabirds and Shorebirds Assessment	✓
OM4b: Subsea dispersant injection effectiveness monitoring	✗	SM5: Marine Mega-fauna Assessment	✓
OM5: Rapid Marine Fauna Surveillance	✓	SM6: Benthic Habitat Assessment	✓
OM6: Shoreline Clean-up Assessment	✓	SM7: Marine fish and elasmobranch assemblages assessment	✓
OM7: Air Quality Modelling	✓	SM8: Fisheries Impact Assessment	✓
		SM9: Heritage Features Assessment	✓
		SM10: Social Impact Assessment	✓

17.1 Environmental Performance

Table 17-2 indicates the environmental performance outcome, control measures, performance standards and measurement criteria for operational and scientific monitoring.

Table 17-2: Environmental performance – operational and scientific monitoring

Environmental performance outcome	Implement monitoring programs to monitor the effectiveness of control measures and inform response activities; and assess and report on the impact, extent, severity, persistence and recovery of sensitive receptors contacted by a spill or affected by spill response		
Response strategy	Control measures	Performance standards	Measurement criteria
Operational and Scientific monitoring - Preparedness	Response preparedness		
	Maintenance of OSM Services Provider (MSP) contract	[EPS-OSM-002] Maintain contracts with third-party provider/s to provide access to suitably qualified and competent personnel and equipment to assist in the implementation of monitoring in accordance with the capability and resourcing requirements described in Sections 8-10 of the North West Shelf OSM-BIP (7715-650-ERP-0002)	Contract with OSM services provider
	OSM Services Provider capability verified through regular capability reporting	[EPS-OSM-003] Obtain monthly capability reports from OSM services provider to demonstrate that the capability outlined in Section 10 of the North West Shelf OSM-BIP (7715-650-ERP-0002) is available throughout the activity	Monthly capability reports from OSM Services Provider
	Adequacy of existing baseline data sources across the Santos combined EMBA reviewed periodically	[EPS-OSM-004] Regular review of existing baseline data	Baseline data review report
	Water quality monitoring vessels requirements identified	[EPS-OSM-006] Maintenance of vessel specification for water quality monitoring vessels within Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)	Vessel specification
	Pre-completed risk assessment for operational and scientific monitoring activities	[EPS-OSM-016] Pre completed and approved risk assessment is in place with the OSM Services Provider for operational and scientific monitoring activities	OSM Services Provider pre-completed and approved risk assessment
	Access to Santos oil sampling kits	[EPS-OSM-001] Oil sampling kits pre-positioned at Exmouth, Dampier and Varanus Island. Equipment contents as per Appendix C of the Santos Oil and Water Sampling Procedures (7710-650-PRO-0008).	Evidence of deployment to site
OSM Services Provider testing and exercising	[EPS-OSM-005] Annual testing of OSM Services Provider arrangements and capability	Exercise and testing records	

Environmental performance outcome	Implement monitoring programs to monitor the effectiveness of control measures and inform response activities; and assess and report on the impact, extent, severity, persistence and recovery of sensitive receptors contacted by a spill or affected by spill response		
Response strategy	Control measures	Performance standards	Measurement criteria
	OSM-BIP reviewed annually	[EPS-OSM-030] Annual review of OSM-BIP will be conducted in accordance with Section 11 of the North West Shelf OSM-BIP (7715-650-ERP-0002)	Record of revision
Response implementation			
Operational and Scientific monitoring – Activation and Mobilisation	Activate Operational and Scientific Monitoring Plans	[EPS-OSM-010] OMPs and SMPs will be activated in accordance with the initiation criteria provided in Table 9-1 and 9-2 of the Joint Industry OSM Framework (APPEA, 2021)	Incident Action Plan and Incident Log confirm OMPs and SMPs are activated in accordance with the initiation criteria provided in Table 9-1 and 9-2 of the Joint Industry OSM Framework (APPEA, 2021)
	Activation of operational and scientific monitoring plans according to OMPs and SMPs initiation criteria	[EPS-OSM-009] Initiation criteria of OMPs and SMPs will be reviewed during the preparation of the initial IAP and subsequent IAPs; and if any criteria are met, relevant OMPs and SMPs will be activated	IAP/s Incident log
	Mobilisation and implementation of OMPs and SMPs	[EPS-OSM-031] Mobilisation and implementation of OMPs and SMPs will be undertaken in accordance with the indicative timeframes and sequencing described in Part B of the North West Shelf OSM-BIP (7715-650-ERP-0002)	Incident log Monitoring records.
	OSM-BIP	[EPS-OSM-025] Monitoring to be conducted in accordance with the Santos North West Shelf OSM-BIP (7715-650-ERP-0002).	Incident log Monitoring records
	OSM implementation Minimum Standards	[EPS-OSM-026] Implementation of operational and scientific monitoring will comply with the Minimum Standards listed in Appendix A of the Joint Industry OSM Framework (APPEA, 2021)	Incident log Monitoring records
	OSM Services Provider to commence activation within specified time from initial notification	[EPS-OSM-011] OSM services provider shall commence activation process within 30 mins of initial Call-off Order form being received from Santos	OSM services provider records
	Scalable OSM capability	[EPS-OSM-032] If the OSM Implementation Lead identifies that additional monitoring capability is required beyond that described in Section 10 of the North West Shelf OSM-BIP (7715-650-ERP-0002), the need for these resources will be identified as soon as	Incident log OSM services provider records.

Environmental performance outcome	Implement monitoring programs to monitor the effectiveness of control measures and inform response activities; and assess and report on the impact, extent, severity, persistence and recovery of sensitive receptors contacted by a spill or affected by spill response		
Response strategy	Control measures	Performance standards	Measurement criteria
		practicable and mobilised through Santos resources including the OSM Services Provider Contract	
	Co-mobilised monitoring teams	[EPS-OSM-033] Decisions regarding co-mobilisation of monitoring teams will be determined following a spill event, as part of the Incident Action Planning process. These decisions will be made by the IMT in consultation with the OSM Services Provider and relevant stakeholders, with due consideration given to safety, access to sensitive receptors, timing, and data quality requirements	Incident log OSM services provider records.
	Santos to provide support to OSM Services Provider	[EPS-OSM-012] Santos personnel to support OSM services provider through the provision of monitor and evaluate information and relative location of sensitive receptors to the spill	Incident log OSM services provider records
	Mobilisation of appropriately specified monitoring vessels	[EPS-OSM-017] Source monitoring vessel(s) with specifications in accordance with Section 5.2 of Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)	Incident log
Operational and Scientific monitoring – Water quality and dispersant amenability	Ecotoxicity testing of oil samples to take place	[EPS-OSM-007] Oil samples collected to be sent for laboratory ecotoxicity testing of oil	Incident log
	Ecotoxicity testing to derive species protection triggers	[EPS-OSM-008] 90, 95 and 99% Species protection triggers levels will be derived from ecotoxicity testing results (minimum five species' tests) within 24 hours of receiving all results	Ecotoxicity report from environmental contractor
	Dispersant amenability analysis of oil samples to take place	[EPS-OSM-029] If applicable (not MDO), oil samples sent to laboratory for dispersant amenability	Incident Log
Operational and Scientific monitoring – Shoreline assessment and nearshore operations	Use of shallow draft vessels for shoreline and nearshore operations	[EPS-OSM-020] Shallow draft vessels are used for shoreline and nearshore operations unless directed otherwise by the relevant Control Agency	Vessel specification documentation contained in IAP
	Shoreline clean-up assessment direction and leadership	[EPS-OSM-018] OM6: Shoreline Clean-up Assessment will be implemented under the direction of the relevant Control Agency	Incident log

Environmental performance outcome	Implement monitoring programs to monitor the effectiveness of control measures and inform response activities; and assess and report on the impact, extent, severity, persistence and recovery of sensitive receptors contacted by a spill or affected by spill response		
Response strategy	Control measures	Performance standards	Measurement criteria
	SCAT Specialist / Coordinator assessment/selection of vehicle appropriate to shoreline conditions	[EPS-OSM-021] SCAT Specialist / Coordinator assess/select vehicles appropriate to shoreline conditions	IAP demonstrates requirement is met
	Conduct shoreline/ nearshore habitat/ bathymetry assessment	[EPS-OSM-022] Unless directed otherwise by the designated Control Agency, a rapid shoreline/ nearshore habitat/ bathymetry assessment is conducted prior to nearshore activities	IAP records Assessment records
	Establish demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting/ roosting areas and turtle nesting habitat	[EPS-OSM-023] Unless directed otherwise by the designated Control Agency, demarcation zones are mapped out in sensitive habitat areas	IAP demonstrates requirement is met
	Operational restriction of vehicle and personnel movement to limit erosion and compaction	[EPS-OSM-024] Unless directed otherwise by the designated Control Agency, action plans for shoreline operations include operational restrictions on vehicle and personnel movement	IAP demonstrates requirement is met
	Daily SCAT reports issued during SCAT operations	[EPS-OSM-019] Reports from OM6: Shoreline Clean-up Assessment will be provided to the IMT daily, detailing the assessed areas to maximise effective utilisation of resources	Incident log
Operational and Scientific monitoring – Stand-down and termination	Stand-down, termination and post-spill activities	[EPS-OSM-027] Once post-spill SMP monitoring reports are drafted they will be peer reviewed by an expert panel	Monitoring records
	Stand-down, termination and post-spill activities	[EPS-OSM-028] OMPs and SMPs will be terminated in accordance with the termination criteria provided in Tables 9-1 and 9-2 of the Joint Industry OSM Framework (APPEA, 2021)	Incident Action Plan and Incident Log confirm OMPs and SMPs are terminated in accordance with the termination criteria provided in Tables 9-1 and 9-2 of the Joint Industry OSM Framework (APPEA, 2021)

18. Waste Management

Table 18-1 lists the environmental performance outcome, initiation and termination criteria for this strategy.

Table 18-1: Waste management – environmental performance outcome, initiation criteria and termination criteria

Environmental performance outcome	Comply with waste treatment, transport and disposal regulations and prevent secondary contamination while reducing, re-using and recycling waste where possible.
Initiation criteria	Response activities that will be generating waste have been initiated.
Termination criteria	All waste generated from the oil spill response has been stored, transported and disposed as per the regulatory requirements. Agreement is reached with Jurisdictional Authorities to terminate the response.

18.1 Overview

The implementation of some spill response strategies will generate solid and liquid waste that will require rapid management, storage, transport and disposal. It is important that waste is collected and removed efficiently to ensure waste management does not create a bottleneck in response operations.

The type and amount of waste generated during a spill response will vary depending on the spill type/characteristics, volume released, and response strategies implemented. To account for this potential variability, waste management (including handling and capacity) needs to be scalable to allow a continuous response to be maintained.

Where Santos is the Control Agency, or at the request of the designated Control Agency, Santos will engage its contracted WSP to provide sufficient waste receptacles to store collected waste and manage oily waste collection, transport and disposal associated with spill response activities. The WSP will arrange for all personnel, equipment and vehicles to carry out these activities from nominated collection points to licensed waste management facilities. All transport will be undertaken via controlled-waste-licensed vehicles and in accordance with the Environmental Protection (Controlled Waste) Regulations 2004. Santos’ Oil Pollution Waste Management Plan (7715-650-ERP-0001) provides detailed guidance to the WSP in the event of a spill.

Where DTMI is the Control Agency, Santos will provide the Deputy Waste Management Coordinator to the DTMI IMT Logistics Unit to support the DTMI IMT in coordinating waste management services (refer to Table 5-4).

18.2 Implementation Guidance

Table 18-2 provides guidance to the IMT on the actions and responsibilities that should be considered when selecting this strategy. The OSC and/or Incident Commander is ultimately responsible for implementing the response, and may therefore determine that some tasks be varied, should not be implemented or be reassigned.

Table 18-2: Implementation guidance – waste management

Action	Consideration	Responsibility	Complete	
Initial actions	Contact WSP (Primary or Secondary Contact Person) and activate Waste Project Manager.	Refer to Incident Response Telephone Directory (7700-670-PLA-0016. 20) for contact details.	Logistics Section Chief	<input type="checkbox"/>
	Based on operational modelling and applicable response strategies, communicate the type and quantity of empty liquid and solid waste receptacles required to support planned operations.	It is better to overestimate volumes and scale back resources than to underestimate waste volumes.	Logistics Section Chief Planning Section Chief	<input type="checkbox"/>
	Using most recent monitor and evaluate data and any existing and future response activities, determine the most suitable locations for waste receptacles to be positioned and for temporary storage locations to be established.	Shoreline waste collection points (temporary storage site) will be determined by DTMI and will depend upon the location of shoreline clean-up activities and staging areas and the availability of vehicle access routes. Consideration should be given to positioning receptacles and locating temporary storage sites to ensure secondary contamination of sensitive receptors is avoided or minimised. The approval of temporary storage sites is given through DWER.	Logistics Section Chief Planning Section Chief Environmental Unit Leader	<input type="checkbox"/>
	For each receipt location, indicate the anticipated: <ul style="list-style-type: none"> • Material types. • Material generation rates. • Material generation quantities. • Commencement date/time. • Anticipated clean-up duration. • Receptacle types required. • Logistical support requirements. • Approvals required from ports, local governments, landowners, state government agencies (refer to Oil Pollution Waste Management Plan 7715-650-ERP-0001]). 	Consider facilities for waste segregation at source.	Logistics Section Chief Planning Section Chief	<input type="checkbox"/>
	Once the above information is obtained, ensure all necessary waste management information is included in the IAP.	Waste management should be done in accordance with Santos' Oil Pollution Waste Management Plan (7715-650-ERP-0001) and where relevant, the DTMI Waste Management Guidelines (WA), and the respective port, port operator and/or ship owner's waste management plan.	Logistics Section Chief Planning Section Chief Deputy Waste Management Coordinator (DTMI IMT) WSP Operations Supervisor	<input type="checkbox"/>
	Mobilise waste management resources and services to agreed priority locations.	-	WSP Operations Supervisor Logistics Section Chief Deputy Waste Management Coordinator (DTMI IMT)	<input type="checkbox"/>

Action	Consideration	Responsibility	Complete	
Ongoing actions	Provide ongoing point of contact between IMT and WSP.	Logistics Section Chief	<input type="checkbox"/>	
	Ensure all waste handling, transport and disposal practices comply with legislative requirements.	Alert Logistics Section Chief (or delegate) if any non-compliance is anticipated or detected. Site clean-up, removal and disposal of response waste should be conducted in accordance with Santos' Oil Pollution Waste Management Plan (7715-650-ERP-0001), and where relevant, the DTMI Waste Management Guidelines (WA) and the respective port, port operator and/or ship owner's waste management plan.	WSP Operations Supervisor Deputy Waste Management Coordinator (DTMI IMT)	<input type="checkbox"/>
	Ensure records are maintained for all waste management activities, including but not limited to: <ul style="list-style-type: none"> Waste movements (e.g. types of receptacles, receipt points, temporary storage points, final disposal locations). Volumes generated at each site (including total volume and generation rates). Types of waste generated at each site. Approvals obtained (as required). 	-	WSP Operations Supervisor Deputy Waste Management Coordinator (DTMI IMT)	<input type="checkbox"/>

18.3 Waste Approvals

Site clean-up, removal and disposal of response waste should be conducted in accordance with Santos' Oil Pollution Waste Management Plan (7715-650-ERP-0001), and where relevant, the DTMI Waste Management Guidelines and the respective port, port operator and/or ship owner's waste management plan. In addition, regulatory approval may be required for the temporary storage, transport, disposal and treatment of waste, through the DWER.

DWER administers the Environmental Protection Act 1986 (WA) and is the relevant authority for waste management in WA. If required, DTMI may establish an Operational Area Support Group, as defined in the SHP-MEE, to request support from relevant WA Government Agencies (including DWER) during a State waters spill response. The Santos Oil Pollution Waste Management Plan (7715-650-ERP-0001) provides detail on the regulatory requirements for each port/location likely to be used for waste management during any spill response operation associated with Santos' activities.

18.4 Waste Service Provider Capability

Detailed guidance on Santos' WSP responsibilities for spill response waste management is provided in the Santos Oil Pollution Waste Management Plan (7715-650-ERP-0001).

Key responsibilities of the WSP include the following.

- Maintain ER standby preparedness arrangements:
 - Access to personnel, equipment and vehicles required for a first strike and ongoing response commensurate to Santos' worst-case spill and waste requirements.
 - Provide primary and secondary contact details for activation of spill response waste management services.
 - Access to suitably trained personnel for completing critical tasks in spill response waste management.
 - Participate in exercises undertaken by Santos.
- Maintain ability to assist in the Control Agency's IAP and Waste Management Sub-plan process as required.
- Mobilise resources to waste collection points identified by the Control Agency.
- Ensure waste handling, transport and disposal practices meet legislative requirements.
- Keep auditable records of waste streams from collection points to final disposal points.
- Provide regular progress reporting to the Control Agency IMT and a final report relating to quantities and destinations of collected waste.
- Provide a project manager responsible for the rollout of spill response resources to meet spill response waste management objectives.
- Provide location-specific Operations Supervisor/s to handle on-site operational aspects (management of personnel and equipment, reporting and liaison with relevant field-based spill responders).

18.5 Waste Management Resources

Santos has access and capacity to deliver storage receptacles and remove, transport and dispose of all waste material from oil spill response activities to predetermined disposal points.

Table 18-3 provides WSP capability for waste removal and storage, which is in excess of the waste management requirements for spill response activities associated with this OPEP. The weekly removal capacity is 8,778 m³.

The maximum oily waste (including bulking factor of 10) collected from shoreline clean-up would peak in the first week of an 11 week shoreline cleanup response at 2,352 m³, when the majority (> 90%) of the total volume of oil ashore is predicted to accumulate on shoreline receptors, and assuming a worst case shoreline clean-up response of 56 teams for the full seven days (Table 15-5). This volume is predicted to reduce over time as shorelines are progressively cleaned, reducing to 840 m³ per week over the last 3 to 4 weeks of a shoreline clean-up response (Table 15-5). These worst case waste requirements are exceeded by the WSP weekly total removal capacity specified in Table 18-3.

Table 18-3: North West Alliance vehicle and equipment availability

Plant and Equipment	No.	Capacity	Functionality	Uses per week	Waste stored/shifted per week (m3)
Waste removal					
Oily waste					
Skip lift truck	14	Lift up to 10 t, 4.3 m ³ per service	Servicing of skip bins	7	420
Front lift trucks	10	28 m ³ body, 11.2 m ³ per service	Servicing of front lift bins	7	784
Side loading truck	10	18 m ³ body, 7.2 m ³ per service	Servicing of MGBs	7	504
Hook lift truck	8	Lift up to 15 t, 17.5 m ³ per service	Servicing of hook lift bins	7	980
Flat bed truck	16	15 pallet spaces, 17.5 m ³ per service	Servicing of bins	7	840
Liquid oil					
Liquid waste tankers (triple 'road-train' configuration)	10	75 m ³	Collection of liquid waste at the port of reception (Dampier)	7	5,250
Waste storage					
Oily waste					
ISO-tainers	15	22 m ³	Various waste streams	2	660
MGBs	500	240 L	Mobile bins	2	240
Offshore 8 pack lifting cradle (MGBs)	2	16 x 240 L MGBs	Able to remove 16 x 240 L MGBs simultaneously	Continuous	
Lidded bins	6	1,100 L	Contain various waste streams	2	13
Front lift bins	50	3 m ³	Various waste streams	2	300
Front lift bins	25	4.5 m ³	Various waste streams	2	225
Offshore rated front load bins	100	3 m ³	Various waste streams	2	600
Offshore rated bins	45	7 m ³	Various waste streams	2	630
Marrell skip bins	60	6–9 m ³ , assumed 8 m ³ per service	Various waste streams	2	960
Hook lift bins	12	15–30 m ³ , assumed 23 m ³ per service	Various waste streams	25	6,900
Forklift	4	4 t forklift	All areas	Continuous	
Weekly waste storage capacity					10,528
Weekly total waste removal capacity					8,778
Weekly liquid oil removal capacity					5,250

Source: As per Oil Pollution Waste Management Plan (7715-650-ERP-0001)

18.6 Environmental Performance

Table 18-4 indicates the environmental performance outcomes, control measures and performance standards for this response strategy.

Table 18-4: Environmental performance – waste management

Environmental performance outcome	Comply with waste treatment, transport and disposal regulations and prevent secondary contamination while reducing, re-using and recycling waste where possible.		
Response strategy	Control measures	Performance standards	Measurement criteria
Waste management	Response preparedness		
	Access to waste management equipment, personnel, transport and disposal facilities.	[EPS-WM-001] Waste management sourced through contract with waste service provider. Contract with waste service provider to be maintained throughout activity.	Contract with WSP for ER services; Annual desktop assurance report.
	Access to vessels for waste transport	[EPS-WM-002] MSAs with multiple vessel providers maintained throughout activity.	MSAs with vessel providers
	Vessels requirements for containment and recovery waste transport are identified	[EPS-WM-003] Maintenance of vessel specification for waste storage and transport vessels for containment and recovery	Santos Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)
	Response implementation		
	Santos Oil Pollution Waste Management Plan (7715-650-ERP-0001) implemented	[EPS-WM-004] WSP shall: <ul style="list-style-type: none"> Appoint a Project Manager within 24 hours of activation Track all wastes from point of generation to final destination Provide monthly waste management reports and more regular situation reports during the response until termination criteria are met. 	Incident log; Waste tracking records
	Santos Oil Pollution Waste Management Plan (7715-650-ERP-0001) implemented to ensure effective execution and minimise environmental impacts from response	[EPS-WM-006] WSP to provide liquid oil waste tanks for containment and recovery operations to deployment port, if requested, within 24 hours.	Incident log
[EPS-WM-007] WSP to provide waste bins for oil and oily waste (shoreline clean-up operations) to clean-up site or deployment port within 24 hours.		Incident log	

19. Response Termination

The decision to terminate the spill response is made in consultation with the relevant Control Agency/s, Jurisdictional Authorities and other Statutory Authorities that play an advisory role. This decision will be made with consideration of:

- The efficacy and benefit of current response options.
- Any potential for additional pollution.
- Any potential for additional environmental damage caused by further clean-up efforts.
- An assessment of prevailing weather conditions that can increase risk to response teams or increase the efficacy in weathering hydrocarbon.

An Operational NEBA will be conducted to inform the decision-making process. Termination criteria are defined within each section of response activities within this OPEP.

Upon conclusion of the spill response activity, Santos will:

- Prepare detailed reports and collate all documents.
- Report on the performance objectives of each individual spill response activity that was mobilised.
- Undertake an inventory of consumables and prepare accounts.
- Arrange for the return of equipment.
- Arrange for the refurbishment of consumed equipment.
- Investigate the cause of the incident and report to relevant authorities.
- Assess long-term scientific monitoring requirements.

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Appendix A Hydrocarbon characteristics and behaviour

Marine Diesel Oil

ITOPF (2023) categorise MDO as Group II light persistent oil. The physical characteristics of MDO are summarised in Table A- 1. In the marine environment, approximately 10% (by mass) of MDO will not evaporate, though will decay slowly over time.

Under constant wind conditions, about 36.1% of the MDO mass is predicted to evaporate within the first 24 hours, with the remaining oil weathering more slowly via biological and photochemical processes. In variable wind conditions, characterised by stronger winds and breaking waves, entrainment dominates: after 24 hours, ~80.5% of the MDO is forecast to have entrained into the upper water column, with an additional 15% evaporated and <1% remaining as floating oil. Once entrained, the residual MDO is forecast to decay at ~3% per day (up to ~21% after 7 days).

Table A- 1: Properties of MDO

Hydrocarbon type	Density (kg/m ³)	Dynamic viscosity at 20 °C (cSt)	API	Wax content (%)	Pour point °C	Hydrocarbon property classification
MDO	890 (@15 °C)	14.0 at 25 °C	27.5	1	-9.0	Group II / light persistent

Van Gogh Crude

ITOPF (2023) and RPS (2025) categorise Van Gogh crude as a Group IV heavy persistent oil. The physical characteristics of Van Gogh crude are summarised in Table A-2. In the marine environment, a 61.7% residual of the total quantity of Van Gogh crude spilt will remain after the volatilisation and solubilisation processes associated with weathering.

Generally, about 3.8% of the Van Gogh crude mass should evaporate within the first 24 hours (boiling point (BP) < 180 °C); a further 6.6% should evaporate within the first 48 hours (180 °C < BP < 265 °C); and the low volatile portion of 27.9% should evaporate over a longer period (265 °C < BP < 380 °C). Approximately 61.7% (by mass) of Van Gogh crude will not evaporate though will decay slowly over time.

In summary, in the marine environment Van Gogh crude will behave as follows:

- Will spread rapidly in the direction of the prevailing wind and waves
- In calm conditions evaporation is the dominant process contributing to the fate of spilled Van Gogh crude from the sea surface and will account for 10.4% reduction of the net hydrocarbon balance within 24 hours. Evaporation of the residual compounds will slow considerably, and they will then be subject to more gradual decay through biological and photochemical processes
- Has a strong tendency to entrain into the upper water column (0 m – 10 m) (and consequently reduce evaporative loss) in the presence of moderate winds (>10 knots) and breaking waves leaving only a small proportion on the water surface (<0.1%). The residual compounds will tend to remain entrained beneath the surface under conditions that generate wind waves
- The increased level of entrainment in the presence of moderate wind conditions will result in a higher percentage of biological and photochemical degradation in comparison to calm conditions
- Given the proportion of entrained crude and the tendency for it to remain mixed in the water column, the remaining hydrocarbons will decay over time scales of several weeks.

Table A- 2: Properties of Van Gogh crude

Hydrocarbon type	Density (kg/m ³)	Dynamic viscosity at 20 °C (cSt)	API	Wax content (%)	Pour point °C	Hydrocarbon property classification
Van Gogh crude	961 (@15 °C)	662.9	15.7	<5	-15	Group IV / heavy persistent

Source: RPS (2025)

Appendix B Oil Spill Response ALARP Framework and Assessment

ALARP Assessment Framework

Rationale

As part of the regulatory approval requirements for petroleum activities, the EP and/or OPEP must demonstrate that through the implementation of all reasonable control measures environmental risks have been reduced to a level that is As Low As Reasonably Practicable (ALARP).

With respect to hydrocarbon spill risk and response planning, this includes an assessment to demonstrate that the oil spill response control measures are reducing risk to a level that is ALARP.

This ALARP Assessment Framework provides a process to facilitate the identification of all existing and potential spill response control measures, the selection or rejection of which are supported by reasoned arguments.

Guidance Documents

Guidance documents used in the preparation of this framework include:

- Oil Spill Risk Assessment and Response Planning Procedure (SO-91-II-20003)
- NOPSEMA Guidance Note ALARP (N-04300-GN0166, August 2022)
- NOPSEMA Guidance Note Control Measures and Performance Standards (N04300-GN0271, June 2020)
- NOPSEMA Guideline Environment Plan Decision Making (N-04750-GL1721, January 2024)
- NOPSEMA Guidance Note Risk Assessment (GN0165, June 2020)
- NOPSEMA Oil Pollution Risk Management (GN1488, July 2025).

Overview

The ALARP Assessment Framework uses activity-specific information to systematically assess existing and potential control measures and ensure that all practicable control measures are identified and documented.

When selecting controls to reduce risk it is good practice to apply a preferential order; elimination, substitution, prevention, reduction and mitigation. In the context of this ALARP Assessment Framework for oil spill response, all control measures are response strategies to reduce the impacts of an unplanned event that has already occurred. All source control response measures may be classed as 'reduction' in the hierarchy of controls with all other response measures classed as 'mitigation'.

The ALARP Assessment Framework is shown in Figure B - 1.



Figure B - 1: ALARP Assessment Framework

In Figure B - 1, Steps 1 to 5 (in GREEN) denote input information into the ALARP Assessment Framework. This information comprises:

1. **Spill Scenarios:** This step will involve assessing all possible spill scenarios from the activity and identifying the worst-case credible scenarios as a basis for pollution response planning.
2. **Spill Modelling:** A quantitative spill modelling assessment is conducted for the worst-case credible scenarios identified in Step 1.

3. **Protection Priority Areas:** The Environment that may be Affected (EMBA) is the largest area within which impacts from hydrocarbon spills associated with the activity could extend. The EMBA is predicted using spill modelling results from Step 2. Protection Priority Areas (PPA) are locations of high ecological value within the EMBA that would be targeted in response. Selection of PPAs is detailed in the Oil Spill Risk Assessment and Response Planning Procedure (SO-91-II-20003).
4. **NEBA:** Net Environmental Benefit Analysis (NEBA) is used to select the most effective response strategies to protect the PPAs identified in Step 3.
5. **Resource Needs Analysis:** For the response strategies identified through NEBA, the worst-case resource, timing and location requirements are determined using quantitative spill modelling information where applicable. Implementation Guidance is then developed to detail what arrangements and actions are required to be initiated by the Incident Management Team (IMT) to meet the incident requirements up to a worst-case incident.

Through the development of the Implementation Guidance it may be possible to identify resource, timing and location requirements that could be improved. These areas of improvement should be noted in the ALARP so that additional, alternative or improved control measures can be considered in this context.

A detailed ALARP Assessment Framework for the evaluation of control measures is shown in Figure B - 1, Step 6 (in BLUE). Criteria and definitions used to evaluate control measures are shown in Table B-1.

- **6a. Record Control Measures In Effect:** The spill response control measures currently in place for Santos are listed here. The environmental outcomes and effectiveness of the in-effect control measures are noted using the Resource Needs Analysis to assess whether there are any areas of improvement. Environmental outcomes include potential harmful effects of control measures.
- **6b. Identify Potential Additional Control Measures:** Potential control measures are identified with a focus on any control measures that address areas of improvement identified in Step 6a.
- **6c. Investigate Control Measure Categories:** In-effect and potential control measures from Steps 6a and 6b are classified as either additional, alternative or improved, and as either people, system, equipment or procedures. This step serves as a prompt to ensure that potential control measures from all categories are explored.
- **6d. Evaluate Environmental Outcomes and Effectiveness:** The environmental outcomes and effectiveness are assessed for all control measures identified and described through Steps 6a, b, and c.
- **6e. Evaluate Feasibility:** Time, cost and effort required for implementation are assessed for all control measures identified and described through Steps 6a, b, and c.
- **6f. Accept or Reject:** The potential control measure will be accepted or rejected on the basis of environmental outcomes and effectiveness described in Step 6d and whether cost is grossly disproportionate, as described in Step 6e.

When evaluating potential control measures, implementation plans of in-effect control measures are carefully considered to ensure that any accepted control measures will equal or improve Santos' capacity to meet resource needs. Potential control measures are also considered within the context of Santos' current response arrangements to determine if synergies or resource conflicts might occur.

As control measures are evaluated for selection or rejection, they can be compared with industry good practice to ensure that all practicable control measures were implemented. Where unique circumstances exist and further analysis is required, a different evaluation technique may be used, such as technical analysis, detailed cost benefit analysis or combination of approaches.

New information on risks, impacts and response strategies obtained through analysis of operations, exercises and scheduled documentation reviews can be incorporated into the ALARP Assessment Framework cycle in a process of continual improvement.

In Figure B - 1, Steps 7 and 8 show the conclusion of the ALARP Assessment Framework:

7. **Finalised Control Measure Selection:** Outputs from the ALARP Assessment shown in Step 6 comprise finalised control measures (in BLUE).
8. **Develop Performance Standards and Measurement Criteria:** For each control measure finalised in Step 7, performance standards and measurement criteria are then developed and documented in the OPEP (in GREEN).

Performance standards for all accepted control measures should be written to enable the operator to measure, monitor and test effectiveness. Only the key aspects of any given control will require performance standards and these may include the various measures of effectiveness; functionality, availability, reliability, survivability, dependency and compatibility. Parameters set in the performance standard should be 'SMART'; specific, measurable, appropriate, realistic and timely.

Corrective action based on deviations or trends in performance should be taken by amending either the performance standard or the control measure, as appropriate.

Criteria and definitions

Standardised criteria and definitions are used to bring consistency to the ALARP assessment across diverse activities and response strategies. Criteria and definitions are shown in Table B- 1.

Table B- 1: Criteria and definitions of ALARP Assessment Framework

Column	Description
Strategy	Response Strategy
Control Measure	Aspect of Response Strategy being evaluated. Description of the control measure that is In Effect or description of the potential control measure.
In Effect, Alternative, Additional, Improved	In Effect control measures are already in place. Alternative control measures are evaluated as replacements for the control already in effect. Additional control measures are evaluated in terms of their ability to reduce an impact or risk when added to the existing suite of control measures. Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures. Adapted from NOPSEMA Guideline Environment Plan Decision Making N 04750-GL1721, January 2024.
Control Measure Category	A range of different types of controls generally provide effective protection as they offer independence and multiple layers of protection. The OPGGS (Safety) Regulations 2024 refer to technical and 'other' controls where technical control measures involve hardware like shutdown valves and alarms. 'Other' control measures include administrative and procedural control measures such as inductions, a drug and alcohol policy or an inspection regime. Industry practice has further developed this concept of a range of different types of controls based on a POiSTED framework to assess organisational capability: <ul style="list-style-type: none"> • People – personnel. • System – organisation, information/communications, support facilities, training/competency. • Equipment – equipment. • Procedures – doctrine. • Santos aims to implement a range of different types of controls where possible.
Environmental Outcomes	Assessment of environmental benefits, particularly those over and above those environmental benefits documented in the Control Measure that is in effect. Environmental impacts of the Control Measure are also considered here.
Effectiveness	The effectiveness of a Control Measure in reducing the risk to ALARP is evaluated using the following six criteria. Functionality <ul style="list-style-type: none"> • The functional performance of a control measure is what it is required to do. How does the control perform in order to achieve the required risk reduction? Availability <ul style="list-style-type: none"> • Probability that the Control Measure will be available when required and has not failed or is undergoing a maintenance or repair. Reliability <ul style="list-style-type: none"> • The reliability of a control measure is the probability that at any point in time it will operate correctly for a further specified length of time. Reliability is all to do with the probability that the system will function correctly and is usually measured by the mean time between failure. Survivability <ul style="list-style-type: none"> • Whether or not a control measure is able to survive a potentially damaging event such as fire or explosion is relevant for all control measures that are required to function after an incident has occurred. • To achieve their purpose, oil spill response control measures should have high survivability. However, some control measures, such as those involving equipment deployment from an FPSO would have low survivability in an incident that involves an FPSO explosion or fire. Dependency <ul style="list-style-type: none"> • The dependency of the control measure is its degree of reliance on other systems in order for it to be able to perform its intended function. If several control measures can be disabled by one

Column	Description
	<p>failure mechanism (common mode failure), or the failure of one control measure is likely to cause the failure of others, then the control measures are not independent, and it may not be appropriate to count such measures as separate.</p> <ul style="list-style-type: none"> Several control measures are reliant on equipment, people and vessels, hence have high dependency. <p>Compatibility</p> <ul style="list-style-type: none"> Whether or not a control measure is compatible takes into account how alternative control measures may interact with other controls and the rest of the facility, if introduced. Consideration should be given to whether new control measures are compatible with the facility and any other control measures already in use. <p>Adapted from NOPSEMA Guidance Note Control Measures and Performance Standards N04300-GN0271 Revision No 4 June 2020.</p>
Feasibility	Feasibility describes the time, cost and/or effort required to implement the Control Measure.
Accept/Reject	Outcome of assessment and key reasons for the decision.

ALARP Assessment Summaries

ALARP Assessment Summary
<p>Source Control</p> <p>The Control Measures in place for relief well drilling represent industry best practice and are considered to reduce the timeframe for drilling a relief well to as low as reasonably practicable in the context of the risk of an uncontrolled well release during the well intervention / P&A activities. Potential Control Measures were identified and assessed by the Santos Drilling & Completions department representatives. The drilling of a relief well is considered to be an effective control and relief well planning conducted in the area has demonstrated that a MODU will be on site for relief well drilling by day 44 from the start of a well release. Relief well drilling can be completed within 77 days (11 weeks) using MODUs, equipment and specialist personnel that Santos has arrangements to gain access to.</p> <p>Five additional, improved or alternative Control Measures were identified and assessed, but none were adopted as they were assessed as grossly disproportionate to the potential reduction in environmental risk. The rejected control measures were:</p> <ul style="list-style-type: none"> Access to additional source control personnel Pre-drill riser-less intervals for a potential relief well before commencement of well intervention / P&A activities WWCI on standby in Perth during drilling operations in order to respond immediately to a LOWC Dedicated BOP Intervention vessel equipped with ROV tooling package in field Alternative BOP design (Pyrotechnic subsea isolation device) <p>Performance Standards and Measurement Criteria that have been developed for the in-effect Control Measures are shown in Table 9-6. The key performance requirements for relief well drilling are the maintenance, tracking, access and relief well planning arrangements (during times of maintaining preparedness) and the timely mobilisation of resources (during a response). These key areas of effectiveness are reflected in the Performance Standards.</p>
<p>Monitor and Evaluate</p> <p>For the monitor and evaluate strategy, various, independent inputs from multiple service providers are used to build a detailed Common Operating Picture (COP) during the incident.</p> <p>Three additional/ alternative Control Measures were identified and all were assessed and rejected as being grossly disproportionate to the potential reduction in environmental risk:</p> <ul style="list-style-type: none"> Purchase of oil spill modelling system and internal personnel trained to use the system Purchase additional satellite tracking buoys Ensure trained aerial observers based at strategic locations such as Exmouth, Port Hedland and/or Karratha <p>Performance Standards and Measurement Criteria that have been developed for the in-effect Control Measures are shown in Table 10-21. The key areas of effectiveness for the identified Control Measures, during times of preparedness, focus on maintaining access to equipment and personnel through contractual arrangements with vessel providers, aircraft providers, aerial observers, UAV providers, tracking buoys, oil spill trajectory modelling providers and satellite imagery providers.</p>
<p>Mechanical Dispersion</p> <p>Mechanical dispersion is a secondary strategy that could be undertaken by vessels undertaking primary response strategies without the requirement for additional equipment. The use of mechanical dispersion as a response strategy would be assessed as part of an operational NEBA.</p> <p>No alternative, additional or improved Control Measures were identified and assessed.</p> <p>Performance Standards and Measurement Criteria that have been developed for the in-effect Control Measures are shown in the Table 11-4. The key areas of effectiveness for the identified Control Measures during a response relate to the development of an operational NEBA to confirm suitability and environmental benefit of mechanical dispersion and the mobilisation of vessels. These key areas of effectiveness are reflected in the Performance Standards.</p>

ALARP Assessment Summary

Surface Dispersant

Surface dispersant application is a primary response strategy for Van Gogh Crude, to be assessed at the time of a spill where deemed environmentally beneficial by an operational NEBA.

Vessel based dispersant spray systems are available from Santos, AMOSC and AMSA in the region (including stockpiles at Exmouth) and within WA. These spray systems are not considered a limiting factor to surface dispersant operations; the quantity of equipment available to WA through contractual arrangements and the positioning of equipment in first strike locations is considered adequate for the scale of worst-case surface dispersant operations identified in the OPEP. The timely mobilisation of suitable vessels and personnel required for surface dispersant operations are considered to be the key constraints for this strategy. A review of control measures associated with personnel and vessels identified that no further improvement could be made with respect to the identification of suitable surface dispersant vessels or to the availability of personnel without the cost/effort being disproportional to the risk.

Aerial based dispersant application is available to Santos through national and international resources via contractual arrangements. Mobilisation times for these resources are considered to be in line with industry best practice. No additional potential Control Measures were identified that could improve mobilisation times for aerial dispersant application.

Dispersant volumes available within WA, and Australia and the mobilisation of these stocks exceed worst case requirements, hence dispersant is not a limiting factor to the operation.

Eight alternate, additional or improved potential Control Measures were identified and assessed, but were rejected as being grossly disproportionate to the potential reduction in environmental risk. Rejected Control Measures were:

- Access to additional spray systems stored in Karratha, Exmouth or Dampier
- Access to additional spray systems with dispersant stored on vessels
- Access to additional vessels by contracting vessels to remain on standby for chemical dispersion
- Faster access to response personnel via Santos employment of local personnel in locations such as Karratha or Exmouth
- Santos to contract personnel from Exmouth freight and logistics to deploy and operate vessel spray systems
- Access to aircraft via additional service provider
- Access to additional dispersant stockpiles owned by Santos
- Develop and maintain dispersant supply and logistics plan to ensure worst case LOWC surface dispersant application requirements can be met

Performance Standards and Measurement Criteria that have been developed for the in effect and accepted Control Measures are shown in the Table 13-10. The key areas of effectiveness for the identified Control Measures during times of preparedness, are around the maintenance of contracts for the vessel based and aerial dispersant application resources, dispersants and deployment personnel and the tracking of suitable vessels. In the event of a response, the key areas for ensuring effectiveness are the mobilisation of requirements to commence surface dispersant operations, evaluating dispersant efficacy using test sprays and operational monitoring. These key areas of effectiveness are reflected in the performance standards.

Offshore Containment and Recovery

Offshore containment and recovery is identified as a primary response strategy for Van Gogh crude, although with a limited potential area of application (up to 3km from the release site).

Santos, AMOSC, AMSA and OSRL have provisions for spill response personnel and equipment for the worst-case scenario and equipment is available in the northwest region and within WA (including stockpiles in Karratha and Exmouth) which includes offshore rated boom and skimmers suitable for application in response to a potential crude oil spill. Containment and recovery equipment availability is not considered a limiting factor to containment and recovery operations for this activity; the quantity of equipment available to Santos through contractual arrangements and the positioning of equipment in first strike locations is considered adequate for the scale of worst-case containment and recovery operations identified in the OPEP. The timely mobilisation of suitable vessels and personnel required for containment and recovery operations are considered to be the key constraints for this strategy.

A review of Control Measures associated with personnel identified that no improvements could be made to the availability of personnel or vessels (above current arrangements) without the cost/effort being disproportional to the potential reduction in environmental risk.

Four additional or alternative Control Measures were identified and assessed but rejected as being grossly disproportionate. Rejected Control Measures were:

- Purchase additional booms and ancillary equipment to be owned by Santos
- Access to additional vessels by contracting vessels to remain on standby for containment and recovery
- Train additional Santos personnel for spill response teams
- Just-In-Time training to train personnel for containment and recovery operations

Performance Standards and Measurement Criteria that have been developed for the in effect and accepted Control Measures are shown in Table 12-6. The key areas of effectiveness for the identified Control Measures, during times of preparedness, are around maintaining access to suitable vessels, equipment and personnel through contractual arrangements and the tracking of suitable vessels. During response, a key area for increasing effectiveness is the rapid mobilisation of first strike resources so that operations can be undertaken when oil thickness is at its highest. Given effectiveness of this strategy increases with oil concentration and decreases under high wind/sea state conditions, the

ALARP Assessment Summary

consideration of these factors within an operational NEBA (SIMA) is considered a key control for maintaining effectiveness as well as the use of aerial surveillance to direct operations to areas of highest oil concentration.

Waste storage may be a limiting factor for ongoing containment and recovery operations, so a key area for increasing effectiveness will be the application for approval for decanting wastewater from liquid oil waste storage tanks onboard vessels. These key areas of effectiveness have been represented in the Performance Standards for containment and recovery operations.

Shoreline Protection and Deflection

Santos has access to the indicative resource requirements for the worst-case scenario in the OPEP, including mobilisation of shoreline and nearshore booms and ancillary equipment from Exmouth, Karratha, Varanus Island and Fremantle as well as spill response personnel from Santos, AMOSC, AMSA and OSRL. Trained regional Santos personnel can be quickly mobilised to appropriate locations, followed by AMOSC Staff and AMOSC Core Group from Perth. These regional and state resources ensure that equipment and personnel are not a limiting factor in this response strategy. Santos also has Master Services Agreements in place with multiple vessel providers to enable access to shallow draft vessels as well as a list of small vessel providers. Potential Control Measures around providing additional equipment, vessels and personnel, pre-deployment of equipment in remote locations (i.e. Muiron Islands, Montebello Islands, Lowendal Islands, Thevenard Islands, Clerke and Imperieuse reefs), and the placing of a vessel on standby for protection and deflection operations support during the activity were investigated but were considered grossly disproportionate to the risk and the potential environmental benefits. One additional control measure on just-in-time training for spill responders was accepted.

Six additional or improved Control Measures were identified and evaluated. One was accepted as reasonably practicable:

- Just In Time training to train personnel for spill response roles

Five additional/ improved control measures were not adopted, on the basis of being grossly disproportionate to the potential reduction in environmental risk:

- Santos to purchase additional shoreline and nearshore booms and ancillary equipment
- Pre-deployment of protection and deflection resources in remote locations
- Access to additional shallow draft boom-tow vessels owned by Santos
- Dedicated vessel placed on stand-by for protection and deflection operations support in remote locations
- Ensure trained personnel based at strategic locations such as Dampier, Port Hedland, Karratha, Exmouth or Broome

Performance Standards and Measurement Criteria that have been developed for the in-effect and accepted Control Measures are shown in the Table 15-1. The key areas of effectiveness for the identified Control Measures, during times of preparedness, are around maintaining access to equipment and personnel through contractual arrangements. During response, a key area for ensuring effectiveness is the mobilisation of requirements in order to commence protection and deflection operations and the preparation of an operational NEBA for each operational period that takes into account protection priorities and the ongoing effectiveness of the response strategy. These key areas of effectiveness have been represented in the Performance Standards for protection and deflection operations.

Shoreline Clean-up

Santos has access to the indicative resource requirements for the worst case scenario in the OPEP, including manual clean-up and flushing equipment, decontamination/staging equipment from Exmouth, Karratha, Varanus Island and Fremantle and temporary storage as well as shoreline clean-up personnel from a combination of Santos, AMOSC, AMSA and OSRL.

Trained Santos personnel located in regional areas can be quickly mobilised to appropriate locations, followed by AMOSC Staff and AMOSC Core Group from Perth. Equipment and trained personnel are not expected to be limiting factors for this response strategy. Santos also has Master Services Agreements in place with multiple vessel providers to allow access to shallow draft vessels. Various shoreline clean-up response Control Measures were also identified. Potential Control Measures around providing faster access to clean-up plant, equipment, vessels and personnel, pre-deployment of equipment in remote locations (i.e. Muiron Islands, Montebello Islands, Lowendal Islands, Thevenard Islands, Clerke and Imperieuse reefs), and the placing of a vessel on standby for shoreline clean-up operations support during the activity were investigated but were either not feasible or were considered grossly disproportionate to the risk and the potential environmental benefits. One additional control measure on just-in-time training for spill responders was accepted.

Ten additional or improved Control Measures were identified and evaluated. One was accepted as reasonably practicable:

- Just In Time training to train personnel for spill response roles

Nine additional/ improved control measures were rejected on the basis of being grossly disproportionate to the potential reduction in environmental risk:

- Mechanical mobile plant equipment for clean-up pre purchased and positioned at strategic locations (e.g. Karratha, Dampier or Port Hedland);
- Pre-purchase and storage of equipment (decontamination/ staging equipment, clean-up and flushing, PPE) at strategic locations (e.g. Karratha, Dampier or Port Hedland);
- Pre-deployment of shoreline clean-up resources in remote locations;
- Access to additional shallow draft vessels owned by Santos WA to transport personnel to key sensitive areas on offshore islands;
- Dedicated vessel placed on stand-by for shoreline clean-up operations support in remote locations;

ALARP Assessment Summary

- Access to additional team leaders that are locally based at strategic locations (Dampier) or can be mobilised within short time frames;
- Faster access to clean-up personnel via Perth based labour hire contractor;
- Faster access to clean-up personnel via locally based labour hire companies or emergency response organisations;
- Faster access to clean-up personnel via Santos employment of local personnel.

Performance Standards and Measurement Criteria that have been developed for the in effect and accepted Control Measures are shown in the Table 15-6. The key areas of effectiveness for the identified Control Measures, during times of preparedness, are around maintaining access to suitable equipment and personnel through contractual arrangements. During response, a key area of effectiveness is the rapid mobilisation of equipment and personnel and preparation of a Shoreline Clean-up Sub-plan and operational NEBA to ensure that impacts from response activities are minimised and operations are conducted in accordance with protection priorities as confirmed by the Control Agency.

Oiled Wildlife

Oiled wildlife equipment including first strike kits and containers can be mobilised from regional locations and Perth. Further equipment is available through national or international resources to implement a timely and sustained response adequate for the scale of worst-case oiled wildlife operations identified in the OPEP. Control Measures around the provision of trained personnel were reviewed to identify that trained Santos personnel could be based not just in the Perth Office but also at Varanus Island facilities. Potential Control Measures around additional responders through pre-hiring or contracts with additional service providers were investigated but were found to be not beneficial and/or the cost was grossly disproportionate to risk reduction. Control measures around the pre-positioning of equipment in strategic locations, and the pre-positioning of an OWR field station vessel, were considered but were found to be grossly disproportionate to the potential reduction in environmental risk. A control measure around developing a specification for an OWR field station vessel was accepted.

Four additional or alternative Control Measures were identified and assessed. One was accepted as reasonably practicable:

- Vessel specifications for an OWR field station included within planning documentation (Santos Marine Vessel Requirements for Oil Spill Response [7710-650-ERP-0001]).

Three control measures were rejected as grossly disproportionate to the potential reduction in environmental risk. Rejected control measures were:

- Pre-positioning of an OWR field station vessel to enable rapid response in remote locations;
- Pre-hire and/or prepositioning of staging areas and responders;
- Direct contracts with service providers.

Performance Standards and Measurement Criteria that have been developed for the in effect and accepted Control Measures are shown in the Table 16-7. The key areas of effectiveness for the identified Control Measures, during times of preparedness, are around maintaining access to equipment and personnel through contractual arrangements. During response, the mobilisation of requirements for initial oiled wildlife response operations and the management of the oiled wildlife response in accordance with the Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) are both key elements for achieving this strategy and they are represented as a Performance Standard.

Operational and Scientific Monitoring

Oil spill operational and scientific monitoring will be conducted on behalf of Santos by contracted OSM Service Provider, via the OSM Supplementary Services Agreement, as detailed in the North West Shelf OSM-BIP (7715-650-ERP-0002).

Four additional potential Control Measures were identified but all were rejected as grossly disproportionate to the potential reduction in environmental risk:

- Monitoring personnel and equipment on standby in Dampier;
- Contract additional OSM Service Providers to increase availability of monitoring personnel in the first 2 weeks of the spill;
- Ensure trained monitoring specialists are available on site;
- Ensure trained marine mammal/fauna observers based at strategic locations such as Port Hedland, Karratha and Broome.

Performance Standards and Measurement Criteria that have been developed for the in effect and accepted Control Measures are shown in the Table 17-2. The key areas of effectiveness for the identified Control Measures, during times of preparedness, are around maintaining access to equipment and personnel through contractual arrangements, regular reviews of OSM service provider capability and reviews of existing baseline data. During response, a key area for effectiveness is the mobilisation requirements to commence operational and scientific monitoring, and ensuring that relevant operational and scientific monitoring plans are followed.

Waste Management

The Santos contract with a waste service provider has provisions for waste management operations of the scale estimated to be required in worst case scenarios detailed in the OPEP. Further detail is captured in the Waste Management Plan - Oil Spill Response Support (7715-650-ERP-0001). The waste service provider can mobilise waste receptacles from Karratha within 24 hours. Given the waste service provider arrangements and pre-planning already undertaken, waste storage facilities, road transport and logistics are not expected to be limiting factors in the response. Areas of improvement were identified regarding the availability of vessels required for waste transport at sea and additional storage tanks. Four potential additional Control

ALARP Assessment Summary

Measures were identified and assessed to reduce these risks, one of which was accepted and the other three rejected due to the cost being grossly disproportionate to the potential reduction in environmental risk.

The accepted control measure was:

- Monitoring and hire of additional vessels located in the region, tracked via the WA Vessel Monitoring System (IHS Maritime Portal), and contracted at the time of incident.

The three rejected control measures were:

- Maintain contracts with multiple service waste providers;
- Procure temporary waste storage for Santos stockpile;
- Contract additional vessels on standby for waste transport.

Performance Standards and Measurement Criteria that have been developed for the in-effect Control Measures are shown in the Table 18-4. The key areas of effectiveness for the identified Control Measures, during times of preparedness, are regarding maintaining access to waste management equipment and services through contractual arrangements. During response, a key area for increasing effectiveness is the timely mobilisation of requirements for initial response operations and defining critical management and reporting services to be provided by the waste service provider. These key areas of effectiveness are captured in the Performance Standards.

Appendix C Pollution Report



When blank, this form is classed as **OFFICIAL**, when filled out, this form is classed as **OFFICIAL-SENSITIVE**.

BEFORE completing this form please contact the MEER duty officer on (08) 9480 9924 (24hrs). Immediate reporting will enable a rapid response.

Return completed form to:
Maritime Environmental Emergency Response
Department of Transport
Email: marine.pollution@transport.wa.gov.au and rccaus@amsa.gov.au
Phone (08) 9480 9924

INCIDENT DESCRIPTION

Incident Name: _____ Date and Time of Incident (24 hr format): _____

Location name/description: _____

Incident Coordinates: Latitude of spill _____ Longitude of spill _____

Description of Incident: _____

Weather conditions at site: _____

OIL DETAILS

Pollutant source

Amount of fuel/pollutant on board: _____

Vessel _____ Land (Specify) _____ Other (Specify) _____ Unknown _____

Vessel type (if known) Tanker _____ Container _____ Bulk _____ Cargo _____

Fishing _____ Defence _____ Recreational _____ Other (Specify) _____

Vessel name: _____ Flag State / Callsign: _____ Australian vessel? Yes No

Pollutant

Oil (type) Bilge Diesel HFO bunker Crude Unknown Other (Specify) _____

Chemical Name: _____ MARPOL cat / UN Nos: _____

Garbage Details/description: _____

Packaged Details/description: _____

Sewage Details/description: _____

Other Details/description: _____

Extent

Size of spill (length & width in metres): _____

Amount of pollutant spilt, if known (litres): _____

Has the discharge stopped? Yes No Unknown

Photos taken Details: _____ held by: _____

Video taken Details: _____ held by: _____

Samples taken Description: _____ held by: _____

Items retrieved Description: _____ held by: _____

Appendix D Situation Report



When blank, this form is classed as **OFFICIAL**, when filled out, this form is classed as **OFFICIAL-SENSITIVE**.

Return completed form to:
Maritime Environmental Emergency Response
Department of Transport
Email: marine.pollution@transport.wa.gov.au and rccaus@amsa.gov.au
Phone (08) 9480 9924

MARITIME ENVIRONMENTAL EMERGENCY SITUATION REPORT (SITREP)

This is advice from the Control Agency of the current status of the incident and the response.

This form is transmitted to all relevant agencies including:

- Jurisdictional Authority
- Support Agencies

INCIDENT DESCRIPTION

Incident Name: _____ Ref. No. _____

Incident Controller: _____

Incident Declaration Level: _____ Controlling Agency: _____

Priority Urgent Immediate Standard

Final SITREP? Yes No

Next SITREP on: _____

Date and Time of Incident (24 hr format): _____

POLREP or AMSA Form 18 Reference : _____

Incident location: _____ Latitude: _____ Longitude: _____

Brief description of incident and impact: _____

Overall weather conditions: _____

Summary of response actions to date: _____

Current Strategies: _____

Summary of resources available/deployed: _____

Expected developments: _____

Other Information: _____

Maritime Environmental Emergency Situation Report (SITREP)

Reporter's Signature:

Name:	Agency:	Role:
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Once you have completed the form please check that all relevant fields have been filled with accurate data.
Please email completed form to marine.pollution@transport.wa.gov.au

Appendix E Vessel Surveillance Observer Log

Vessel Surveillance Observer Log – Oil Spill

Survey Details			
Date	Start time:	End Time:	Observers:
Incident:			Area of Survey:
Vessel:			Master:
Weather Conditions			
Wind speed (knots):		Wind direction:	
Time high water and height (LAT):		Current direction:	
Time low water and height (LAT):		Current speed (nM):	
Tide during observations:		Sea state:	
Stage of tide during observations (incoming/falling):		Other weather observations:	

Slick Details									
Slick grid parameters by lat/long:				Slick grid parameters (vessel speed)		Slick grid dimensions: N/A			
Length Axis:		Width Axis:		Length Axis: N/A		Width Axis	Length	nm	
Start Latitude		Start Latitude		Time (seconds)		Time (seconds)	Width	nm	
Start Longitude		Start Longitude					Length	nm	
End Latitude		End Latitude		Speed (knots)		Speed (knots)	Width	nm	
End Longitude		End Longitude					Grid area	km ²	
Code	Colour	%age cover observed	Total grid area	Area per oil code		Factor	Oil volume		
1	Silver		km ²		km ²	40-300 L/ km ²		L	
2	Iridescent (rainbow)		km ²		km ²	300-5,000 L/ km ²		L	
3	Discontinuous true oil colour (Brown to black)		km ²		km ²	5,000-50,000L/ km ²		L	
4	Continuous true oil colour (Brown to black)		km ²		km ²	50,000 – 200,000 L/ km ²		L	
5	Brown / orange		km ²		km ²	>200,000 L/ km ²		L	

Timeline of observations:

Time	Description

Appendix F Aerial Surveillance Observer Log

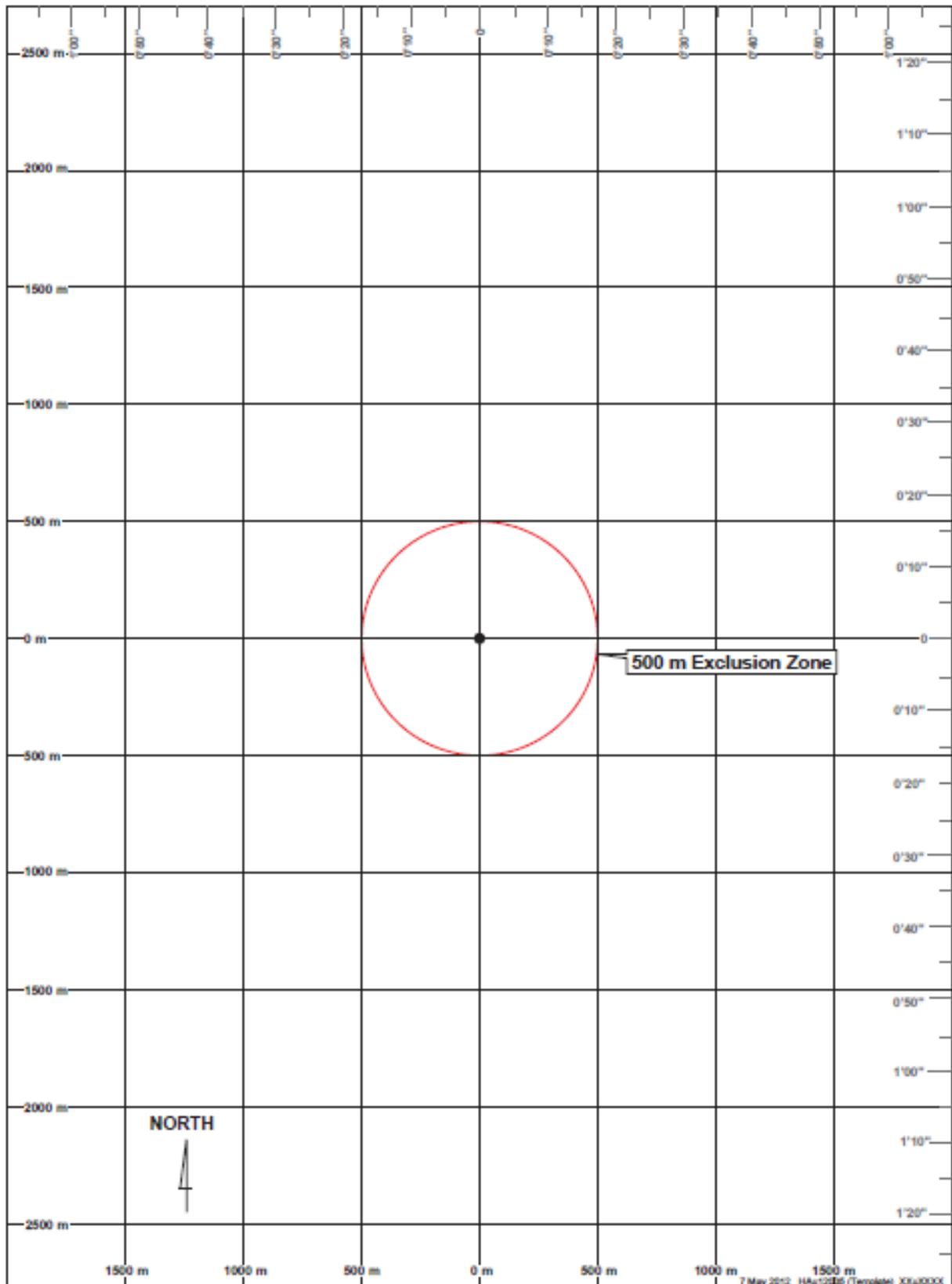
Aerial Surveillance Observer Log – Oil Spill

Survey Details			
Date:	Start time:	End Time:	Observer/s:
Incident:		Area of Survey:	
Aircraft type:	Call sign:	Average Altitude:	Remote sensing used:
Weather Conditions			
Wind speed (knots)		Wind direction	
Cloud base (feet)		Visibility	
Time high water		Current direction	
Time low water		Current speed (nM)	

Slick Details									
Slick grid parameters (lat/long)				Slick grid parameters (air speed)		Slick grid dimensions			
Length Axis		Width Axis		Length Axis		Width Axis	Length	nm	
Start Latitude		Start Latitude		Time (seconds)		Time (seconds)	Width	nm	
Start Longitude		Start Longitude					Length	nm	
End Latitude		End Latitude		Air Speed (knots)		Air Speed (knots)	Width	nm	
End Longitude		End Longitude					Grid area	km ²	
Code	Colour	% cover observed	Total grid area		Area per oil code		Factor	Oil volume	
1	Silver			km ²		km ²	40-300 L/ km ²		L
2	Iridescent (rainbow)			km ²		km ²	300-5,000 L/ km ²		L
3	Discontinuous true oil colour (Brown to black)			km ²		km ²	5,000-50,000L/ km ²		L
4	Continuous true oil colour (Brown to black)			km ²		km ²	50,000 – 200,000 L/ km ²		L
5	Brown / orange			km ²		km ²	>200,000 L/ km ²		L

Appendix G Aerial Surveillance Surface Slick Monitoring Template

AERIAL SURVEILLANCE SURFACE SLICK MONITORING TEMPLATE



	NAME:	VESSEL / AIRCRAFT:
	DATE / HOUR:	OTHER REFERENCE:

**Appendix H Aerial Surveillance Marine Fauna
Sighting Record**

OIL SPILL SURVILLANCE - MARINE FAUNA SIGHTING RECORD SHEET

Date:		Time:	
Latitude:		Longitude:	

MARINE FAUNA ID GUIDE



Humpback whale



Blue whale



Whale shark



Dugong



Minke whale



Sperm whale



Hawksbill turtle



Loggerhead turtle



Killer whale



Bryde's whale



Green turtle



Flatback turtle

Whale species unknown



Bottlenose dolphin



Spinner dolphin



Leatherback turtle

Dolphin species unknown

Turtle species unknown

FAUNA DETAILS					
Category	Type/species? Adult/juvenile? ID confidence?	Number	Date/Time	Photo/ video taken? Reference No.	<u>Behaviour / Comments.</u> Proximity to oil? Oiled? Milling? Feeding? Transiting?
Cetaceans (Whales/ Dolphins)					
Turtles					
Birds					
Dugongs					
Sharks					
Other					

Other details for each observation location

WEATHER DETAILS

- Sea State** Mirror calm Small waves Slight ripples
 Large waves some whitecaps Large waves, many whitecaps
- Visibility** Excellent Good Moderate Poor Very Poor

OBSERVER DETAILS

Observer Name

Observer signature

Observer Inexperienced Experienced

Appendix I Aerial surveillance shoreline observation log

Aerial Surveillance Reconnaissance Log – Oil Spill

Survey Details					
Incident:	Date:	Start time:	End Time:	Observer/s:	
Area of Survey					
<u>Start GPS</u> LATITUDE: LONGITUDE:			<u>End GPS</u> LATITUDE: LONGITUDE:		
Aircraft type	Call sign	Average Altitude	Remote sensing used (if any)		
Weather Conditions					
Sun/Cloud/Rain/Windy	Visibility	Tide Height L/M/H			
Time high water	Time low water	Other			
Shoreline Type - Select only ONE primary (P) and ANY secondary (S) types present					
<input type="checkbox"/>	Rocky Cliffs	<input type="checkbox"/>	Boulder and cobble beaches	<input type="checkbox"/>	Sheltered tidal flats
<input type="checkbox"/>	Exposed artificial structures	<input type="checkbox"/>	Riprap	<input type="checkbox"/>	Mixed sand and gravel beaches
<input type="checkbox"/>	Inter-tidal platforms	<input type="checkbox"/>	Exposed tidal flats	<input type="checkbox"/>	Fine-Medium sand grained beaches
<input type="checkbox"/>	Mangroves	<input type="checkbox"/>	Sheltered rocky shores	<input type="checkbox"/>	Other
<input type="checkbox"/>	Wetlands	<input type="checkbox"/>	Sheltered artificial structures		
Operational Features (tick appropriate box)					
<input type="checkbox"/>	Direct backshore access	<input type="checkbox"/>	Alongshore access	<input type="checkbox"/>	Suitable backshore staging
Other					

Appendix J Shoreline Clean-up Equipment

Table J-1: Recommended equipment for an initial deployment of a 6-person shoreline clean-up team

Shore clean-up Tools	Quantity
Disposal Bag Labelled, 140 cm x50cm x 100µm	1,000
Disposal Bag large fit 205ltr drum, 100cm x 150cm x 100µm	50
Polyethylene Safety Shovel 247mm z 978mm	2
Steel Shovel	4
Steel Rake	2
Landscapers Rake	2
Barrier Tape – “Caution Spill Area”	10
Pool scoop with extendable handle – flat solid	2
Poly Mop Handle	2
Safety Retractable Blade Knife	2
Poly Rope 20m	6
Star Pickets	24
Star Picket driver	1
Hand Cleaner	1
Cable ties – general use	1,000
Wheel Barrow	2
Galvanised Bucket	4
Pruning secateurs	2
Hedge Shears	1
Personal Protection Equipment (PPE) – Team of 6	
Spill Crew Hazguard water resistant coveralls (assorted sizes)	36
Respirator dust/mist/fume and valve	40
Disposable box light nitrile gloves (100bx)	2
Alpha Tec gloves (assort size)	24
Ear Plugs (200bx)	1
Safety Glasses	18
Safety Goggles non vented	6
Gum Boots (assort size)	18
Rigger Gloves (assort size)	18
Day/Night Vest	6
Storage Equipment	
Collapsible Bund 1.6m x 1.2m	2
Collapsible bund 4m x 2.4m	1
Misc. sizes of ground sheets / tarps.	6
Absorbents	
Absorbent Roll ‘oil and fuel only’ 40m x 9m	6
Absorbent Pad “oil and fuel only” 45cm x 45cm	400
Poly Mops (snags)	150
Poly Absorbent Wipes	10
Additional Items	
Folding Deck Chair 6	6
Folding Table 1	1
Shelter open side 1	1
6 Person first aid kit 1	1
Wide Brim Hat with cord 6	6
Sunburn Cream 1 litre pump bottle 1	1
Personal Eyewash bottle 500mls 6	6
Personal Drink bottle 750mls 6	6
Boxes, Bin and Lid Storage/transport assorted	-
Optional items	
Inflatable tent 9 square metres	1

Table J-2: Recommended equipment list for a decontamination unit for a shoreline clean-up team

Shore clean-up Tools	Quantity
Inflatable Decon Tent	1
Inflatable Tent 9 square metres – Modesty or Control tent	1
Misc sizes of ground sheets/tarps	4
Collapsible Bund 1.6m x 1.2m (two stages)	2
2 stools in each bund	4
Collapsible Bund 4m x 2.4m (for used PPE and clothing into DB's)	1
Long Handled Scrub brush	2
Scrub Brush	2
Simple Green 20 ltr	2
Poly Absorbent Wipes	10
Wet Wipe Canister	6
Disposal Bag for Clothing, 140cm x 50cm x 100µm	100
Bath towel	6
Liquid soap in push dispenser (citrus based)	1
Track mat – Absorbent for Corridor/walkway	1
Star pickets	16
Star picket driver	1
Barrier tape to create corridors	4
Safety Goggles non vented (used during decon)	6
Additional items	
Folding Deck Chair	6
Folding Table	1
Shelter open side	1
6 Person first aid kit	1
Wide Brim Hat with cord	6
Sunburn Cream 1 litre pump bottle	1
Personal Eyewash bottle 500mls	6
Personal Drink bottle 750mls	6
Boxes, Bin and Lid Storage/transport assorted	-

Table J-3: Recommended equipment list for deployment of a 6-person team for shoreline flushing or recovery

Flushing Equipment	Quantity
Diesel self prime semi trash pump, 25-35 psi, 4.8hp	1
Perforated 2" lay flat hose, 20 m sections	2
Section Hose 2", 20m sections	5
Hose End Strainer	1
Recovery Equipment	
Tidal Boom (shoreline boom) 25m lengths	2 (50m)
Tidal Boom Accessories pack 1	1
Versatech Zoom Curtin Boom 300mm chamber, 450mm skirt 25m section 2 (50m)	2 (50m)
Towing Bridle 2	2
Danforth Sand Anchor Kit, 30m lines, 15m trip lines 3	3
Diesel Powered pump with hose 1	1
Manta Ray skimmer 1	1
Personal Protection Equipment (PPE) – Team of 6	
Spill Crew Hazguard water resistant coveralls (assorted sizes)	36
Respirator dust/mist/fume and valve	40
Disposable box light nitrile gloves (100 box)	2
Ear Plugs (200 box)	1
Safety Glasses	18
Gum Boots (assorted sizes)	18
Hyflex Oil Restraint Gloves (assorted sizes)	18
Day/Night Vest	6
Storage Equipment	
Collapsible Bund 1.6m x1.2m	1
Misc sizes of ground sheets/tarps	6
Collapsible Tank 5,000 litres	2
Absorbents	
Absorbent Boom 'oil and fuel only' 3 or 6m x 180,mm	200 m
Absorbent Roll 'oil and fuel only' 40m x 9m	10
Absorbent Pad "oil and fuel only" 45cm x 45cm	1,000
Poly Absorbent Wipes	10
Additional Items	
Folding Deck Chair	6
Folding Table	1
Shelter open side	1
6 Person first aid kit	1
Wide Brim Hat with cord	6
Sunburn Cream 1 litre pump bottle	1
Personal Eyewash bottle 500mls	6
Personal Drink bottle 750mls	6
Boxes, Bin and Lid Storage/transport assorted	-
Inflatable Tent 9 square metres	1

Table J-4: Recommended equipment list for a 6-person team for near shore clean-up

Absorbents	Quantity
Absorbent Roll 'oil and fuel only' 40m x 9m	20
Absorbent Pad "oil and fuel only" 45cm x 45cm	2,000
Absorbent Boom "oil and fuel only" 3or6m z 180mm	200 m
Poly Mops (snags)	150
Poly Absorbent Wipes	20
Recovery Equipment	
Tidal Boom (shoreline boom) 25m lengths	4 (100 m)
Tidal Boom Accessories pack	2
Versatech Zoom Curtin Boom 300mm chamber, 450mm skirt 25m section	8 (200 m)
Towing Bridle	2
Danforth Sand Anchor Kit 15kg 30m lines, 15m trip lines	10
Weir Skimmer 30T hr	1
Trash Screen for above	1
Diesel Powered pump with hose	1
Manta Ray skimmer	1
Shore Clean-up Tools	
Disposal Bag large fit 205ltr drum, 100cm x 150cm x 100µm	200
Pool scoop with extendable handle – flat solid	2
Poly Mop Handle	2
Poly Rope 20m	10
Star Pickets	24
Star Picket driver	1
Intrinsic Safe Torch	6
Hand Cleaner	1
Cable ties (to add extra join to absorbent booms)	150
Personal Protective Equipment (PPE) Team of 6	
Spill Crew Hazguard water resistant coveralls (assorted sizes)	36
Disposable box light nitrile gloves (100 box)	2
Alpha Tec gloves (assorted sizes)	24
Ear Plugs (200bx)	1
Safety Glasses – with head strap	18
Gum Boots (worn extra large or as advised by skipper)	18
Steel cap waders	2
Personal Flotation Device	6
Rigger Gloves (assort size)	18
Storage equipment	
Collapsible Bund 1.6 m x 1.2 m	2
Collapsible bund 4 m x 2.4 m	1
Collapsible Tank 5,000 litres	2
Alum box, Bin & lid Storage/transport cases	10
Misc. sizes of ground sheets/tarps	6
Additional Items	
6 Person first aid kit 1	1
Wide Brim Hat with cord 6	6
Sunburn Cream 1 litre pump bottle 1	1
Personal Eyewash bottle 500mls 6	6
Personal Drink bottle 750mls 6	6

Appendix K Shoreline Response Strategy Guidance

Guidance on response methods for sensitive coastal habitats is provided in Table K-1.

Guidance on applicable shoreline clean-up techniques based on shoreline substrate and degree of oiling are presented in Figure K-1 to Figure K-4.

Table K-1: Strategy Guidance for shoreline response at coastal sensitivities

Sensitive receptors	Strategy guidance
Mangroves	<ul style="list-style-type: none"> All efforts should be mounted to prevent any oil from moving towards this area by using booms to divert the oil away from this area. However, if oil is expected to move into this area, multiple rows of booms, or earthen booms can be deployed at the entrance of creeks or along the mangrove fringe to prevent/minimise oiling. Sorbents can be used to wipe heavy oil coating from roots in areas of firm substrate. Close supervision of clean-up is required. Where thick oil accumulations are not being naturally removed, low-pressure flushing may be attempted at the outer fringe – sorbent pads and sorbent sweeps can be used to recover the sheen. No attempt should be made to clean interior mangroves, except where access to the oil is possible from terrestrial areas. Oily debris should be removed; it is extremely important to prevent disturbance of the substrate by foot traffic; thus most activities should be conducted from boats. Live vegetation should not be cut or otherwise removed.
Mudflats	<ul style="list-style-type: none"> All efforts should be mounted to prevent any oil from moving towards this area by using booms to divert the oil away from this area. However, if oil is expected to move into this area, multiple rows of booms, or earthen booms can be deployed at the entrance of channels filling/ draining mudflats. Efforts to manually clean mudflats may result in further damage due to trampling of the oil into sediments which typically rich in biota and provide a food source for fish and birds. Therefore, natural remediation may be the preferred approach and if removal is required, the flushing of oil into open water, if feasible, may be preferred to manual collection The presence of wildlife (e.g. shorebirds) and sensitive flora (e.g. mangroves) which are often associated with mudflats needs to be considered in determining the best approach.
Sandy beaches	<ul style="list-style-type: none"> Clean-up techniques will depend upon the degree of infiltration into sand or and degree of burial which will require surveying/mapping Clean-up will also depend upon sensitivity of environment (existing ecological features), access to the beach and potential for additional erosion. Oil and oiled sediments can be physically removed offsite, moved to surf zone for surf washing of sediment or assisted to move to water edge by ploughing of channels or flushing. Recovery of oil can be by manual means (hand tools) or mechanical means (earth moving, pumping equipment). The sensitivity of the environment is a key factor, with manual removal creating less waste and disturbance but more consuming in time and resources.
Seabirds, shorebirds and migratory waders	<ul style="list-style-type: none"> All efforts should focus on deflecting oil away from this area or dispersing the oil offshore or using booms offshore to divert the oil away from this area. If oil is expected to move into the coastal colonies and roosting areas, multiple booms can be deployed along the reserve to prevent/minimise oiling.
Turtle nesting beaches during or near nesting season	<ul style="list-style-type: none"> All efforts should be mounted to prevent any oil from moving towards this area by using booms to divert the oil away from this area. However, if oil is expected to move into this area, booms can be deployed along the reserve to prevent/minimise oiling.
Fringing coral reef communities	<ul style="list-style-type: none"> Little can be done to protect coral reef beds along exposed sections of shoreline. Floating oil would potentially coat living reef communities, which are usually slightly elevated and are consequently exposed at low tide.

Sensitive receptors	Strategy guidance
(Note: submerged coral reef communities are less susceptible to oiling)	<ul style="list-style-type: none"> • Natural recovery with a close monitoring program is the preferred clean-up technique. Clean-up of the reef itself by natural processes is expected to be rapid. • As much as practicable, oil should be removed from adjacent intertidal areas to prevent chronic exposure of the corals to oil leaching from these sites. • Use of sorbents should be limited to those that can be contained and recovered.
Macroalgal and seagrass beds	<ul style="list-style-type: none"> • All efforts should focus on deflecting oil away from this area, dispersing the oil offshore, or using booms to divert the oil away from this area. • Extreme care should be taken not to disturb the sediments during clean-up operations in the vicinity of macroalgal and seagrass beds, which could result in total loss of the macroalgal and seagrass beds. • Removal of oiled parts of the macroalgal and seagrass beds should only be considered when it can be demonstrated that special species are at significant risk of injury from contact or grazing on the macroalgal and seagrass beds. • Otherwise, the best strategy for oiled seaweed is to allow natural recovery.
Rocky coast	<ul style="list-style-type: none"> • Where practicable, booms can be deployed parallel to the rocky coasts to prevent/minimise oiling. • Flushing rocky shoreline is considered the most effective method of cleaning. Care must be taken to assess the fate and transport of the flushed oil and sorbent snares can be used to recover if deemed necessary to reduce impacts to ALARP. • For small areas of contamination, rocky structure can be manually wiped with sorbent pads or scraped to remove oil.

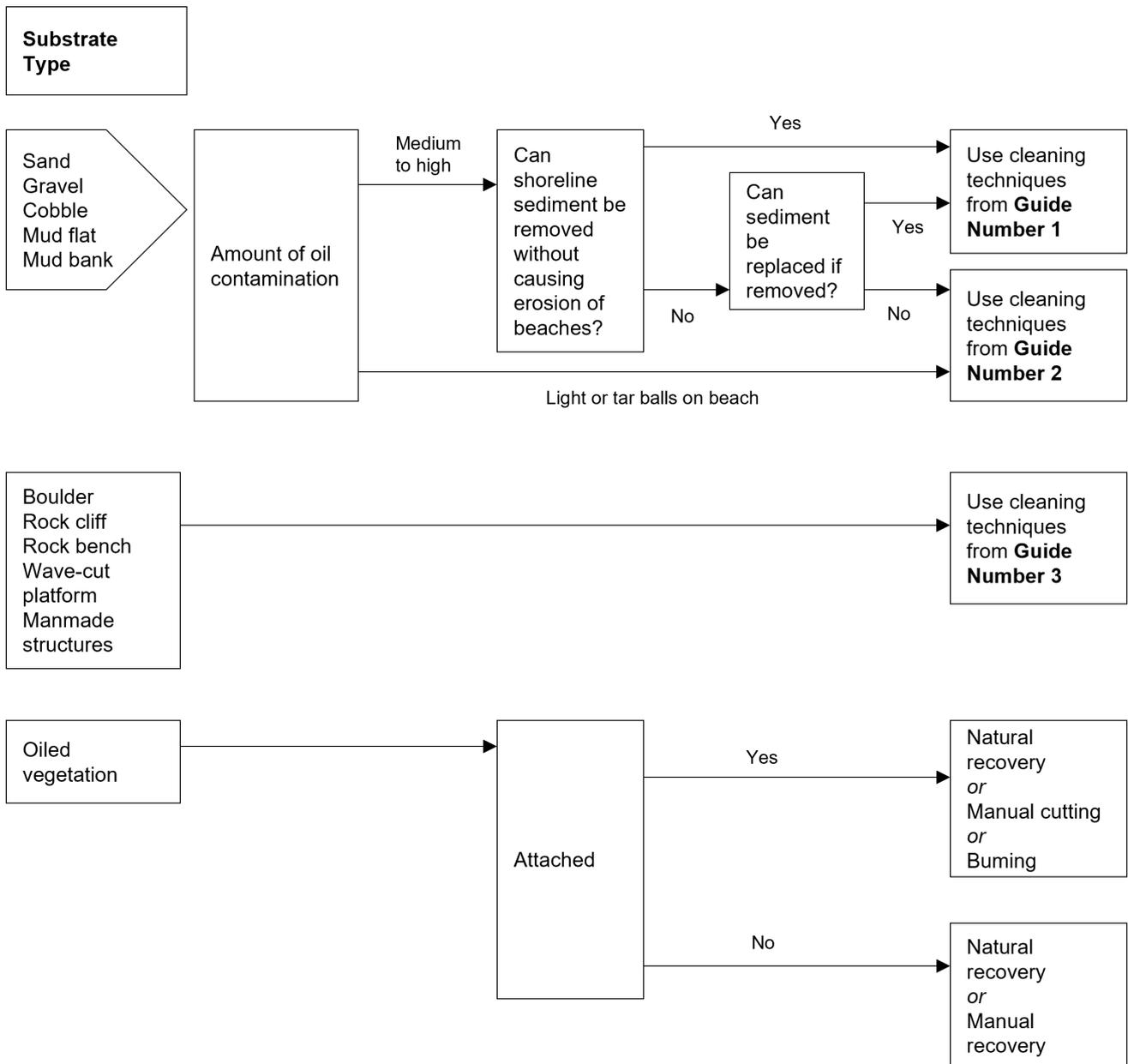


Figure K-1: Shoreline Clean-up Master Decision Guide

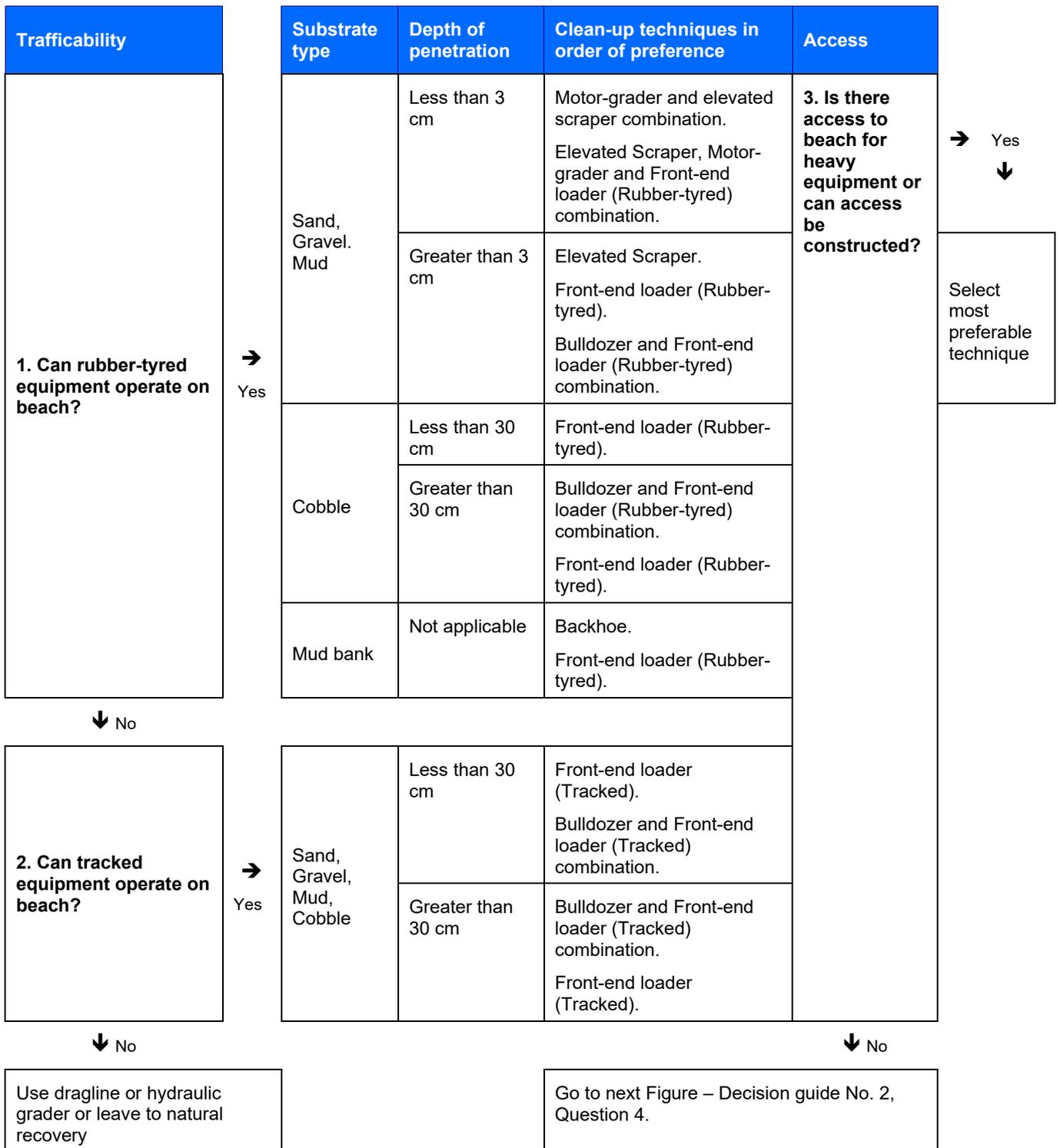


Figure K-2: Shoreline Clean-Up Decision Guide 1

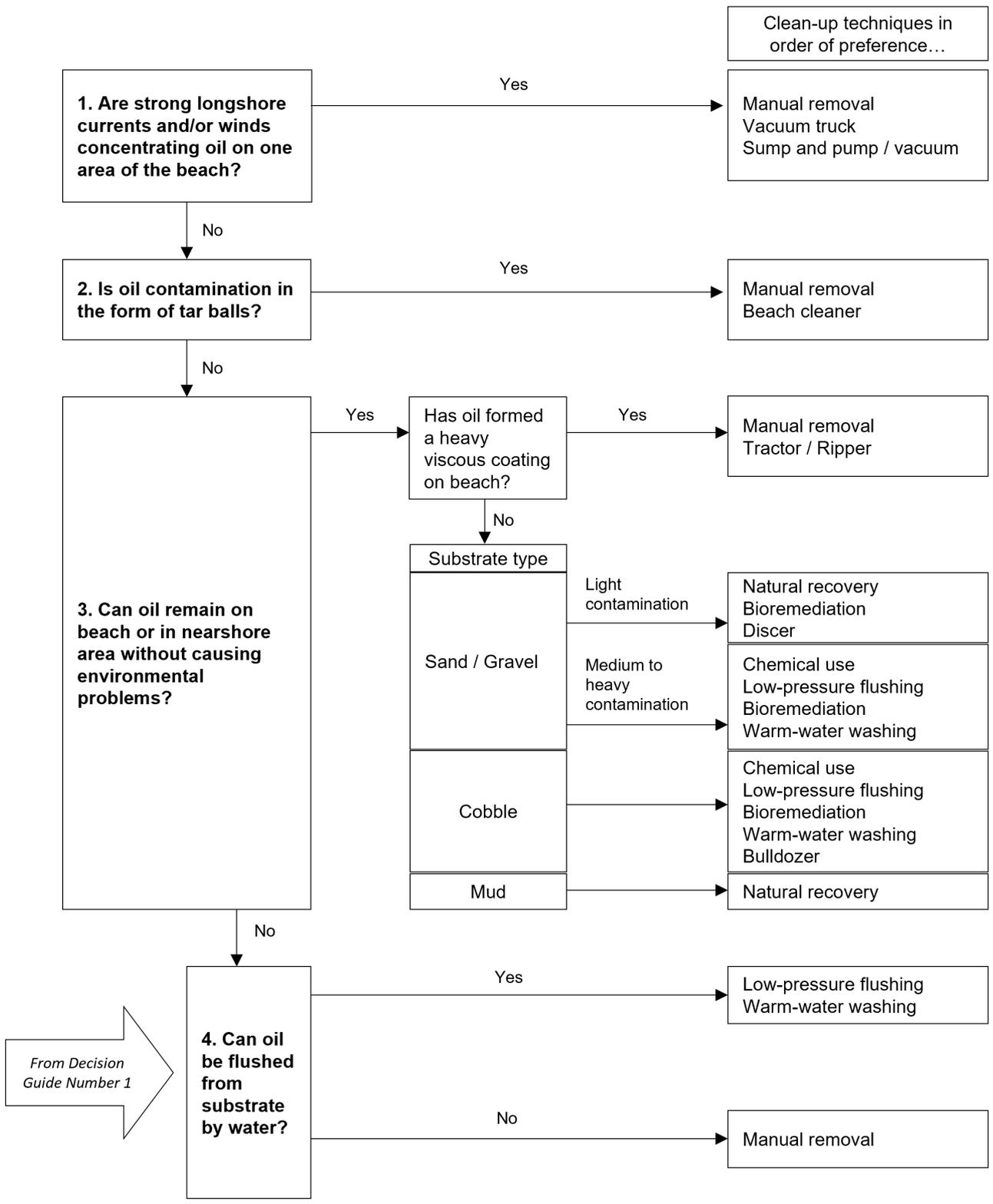


Figure K-3: Shoreline Clean-Up Decision Guide 2

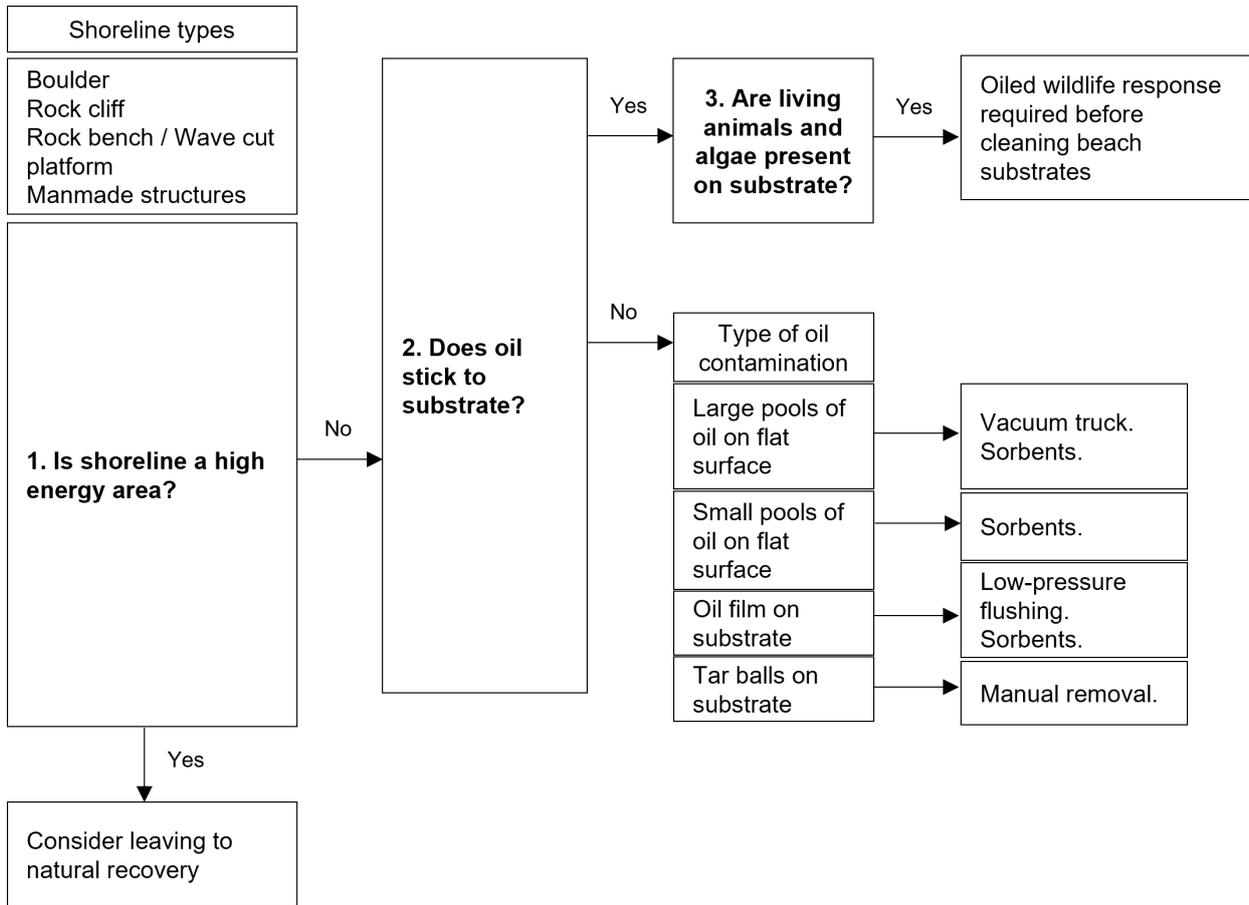


Figure K-4: Shoreline Clean-Up decision Guide 3

Appendix L Operational Guidelines For Shoreline Response

L-1 Worksite preparation guidelines

The following provides guidelines for the preparation of staging areas supporting shoreline clean-up operations.

Organisation and worksite set-up

The worksite does not only include the polluted areas that require cleaning. Several other specific areas must be identified and cordoned off and routes for pedestrians and vehicles should be signposted.

These specific areas are:

- The polluted area;
- The waste storage area, with different types of containers suitable for the different kinds of waste;
- The decontamination area: whatever the size of the spill, a decontamination phase for operational personnel, equipment and tools must be carried out in order to provide some comfort to personnel after each work session, avoiding oiling clean areas, and group together personal clean-up equipment and protective gear, to facilitate the management of the site (cleaning, storage, re-use);
- A rest area, with at least changing rooms, toilets, a first aid kit and cold and hot beverages. Cold or even hot meals can also be organised on the spot provided that a canteen tent or temporary building is available; and
- A storage area for tools and machinery (or equipment warehouse).

Access to the worksite should be restricted and traffic of vehicles should be strictly regulated to avoid accidents.

Preparation

- Prevent the general public from accessing the worksite;
- Delineate accesses for vehicles and machinery (check load-bearing capacity) and routes;
- Channel vehicle and pedestrian traffic;
- Protect the ground (geotextile, roll out mat system...) during operations in sensitive areas (dunes...);
- Prepare and signpost the different areas of activity (on the beach), living areas (locker room, meals, showers, toilets...) and stockpiling areas presenting a risk (fuel, equipment, waste pit....);
- Define a site for fluid storage away from the locker room:
 - Provide an extinguisher for each cabin
 - Set up a recovery system for fuel leaks
- Provide at least minimum lighting for installations and the surrounding area during the winter.

Basic Equipment	Extra Equipment
<ul style="list-style-type: none"> • Plastic liners, geotextiles • Barrier tape and stakes • Signposting equipment 	<ul style="list-style-type: none"> • Bins, barrels, skips, tanks • Hot and cold beverages (Welfare) • Cooking oil, soap (Welfare) • Earthmoving equipment

Primary Storage of Waste

A primary storage site is:

- An emergency staging area of the immediate deposit of the waste collected before its transfer to either an intermediate long term storage site or if possible directly to a treatment facility; and
- A key stage in the waste management process for sorting, labelling and quantifying the types and volumes of waste collected and when possible, reducing volumes to be transported by pre-treatment.

The storage site must be closed as soon as clean-up operations are completed.

The return of the site to its original condition implies:

- A contamination diagnosis made by an organisation specialised in ground pollution, decontamination operations if needed and the approval of the authorities; and
- In some cases, botanical evaluations to define a plant cover restoration operation.

- Segregate the different types of waste
- Protect containers from rain water and to contain odours
- Protect containers from prolonged exposure to sunlight if necessary
- Ensure security to prevent unauthorised dumping

Primary waste storage sites should meet certain criteria:

- Close proximity to the site of clean-up;
- Good access to roads for heavy lorries; and
- A flat area with enough space away from environmentally-sensitive areas (vegetation, groundwater) and out of reach of the sea tides and waves.

- Depending on the volume of waste, site characteristics and availability of containers, prepare:
 - Staging areas
 - Pits if necessary
 - Platform within earth berms
 - Platform for bagged solids and liquids in tank.
- Protect areas using watertight plastic liners
- Lay fine gravel or sand at the base of the storage area to protect the membranes
- Prepare rain water or effluent management
- Ensure correct labelling of the containers to avoid mixing the different types of waste (liquid, solid, non-biodegradable – oiled plastics, contaminated cleanup equipment, biodegradable – oiled seaweed, faunal)
- Control access to the cleanup sites and protect access routes using lining and/or geotextiles

Base Camp / Rest Area

The rest area (base camp) should at least consist of:

- Changing rooms;
- Toilets; and
- A rest area.

At base camp, operators must be provided with:

- A first aid kit; and
- Hot and cold beverages, meals.

Selection of the rest area must meet certain criteria:

- Close proximity to the clean-up site;
- Easy access; and
- A flat area with enough space away from environmentally sensitive areas.

Equipment

- Shelter/rest area (tent, temporary building);
- Portable toilets (at least one for men and one for women);
- Locker rooms;
- First aid kit;
- Fire extinguisher; and
- Communication equipment.

Storage Area for Equipment and Machinery

This area consists of and equipped repair and maintenance site.

In order to avoid incidents and clean-up equipment failures, equipment should only be used by trained personnel and all equipment should regularly be checked for conformity with standard operating procedures and safety.

- Check and adjust daily levels of gasoline, diesel, oil, water and other fluids
- Regularly maintain the machines (pumps, pressure washers...)
- Equipment must be checked, counted by the person in charge of logistics and stored daily at the end of the work day
- Some pieces of equipment must be washed or at least rinsed daily, with proper recovery of cleaning effluent, other kinds of equipment should be washed weekly or at the end of operations
- Set up a systematic maintenance-cleaning-repair operation at the end of each week
- Small tools and equipment and even detachable parts of all equipment remaining outside should be securely stored away (eg stainless steel bucket of small sand screeners)
- In case of interruption of operations, large pieces of equipment should be moved to a supervised site
- Regularly check equipment for conformity and safety

The storage area for equipment and machinery must meet certain criteria:

- Close proximity to the site of clean-up;
- Easy access; and
- A flat area with enough space away from environmentally-sensitive areas.

Equipment

- Cabins;
- Hut;
- Maintenance equipment and tools; and
- Cleaning equipment.

L-2 Manual clean-up guidelines

Oil, polluted sediment and debris are removed by hand or with the help of manual tools and then stored for disposal.

Conditions of use

- Pollution : all types ; most often scattered pollution; on large spills, if implementation of other techniques is impossible;
- Pollutant : all types;
- Substrate : all types; sufficient load bearing capacity for pedestrians and light equipment; and
- Site: all types sufficiently accessible and which tolerate intensive traffic.

Equipment

Basic Equipment:

- Scrapers (paint scrapers, long handle scrapers...), rakes, brushes, forks; and
- Landing nets, shovels, trowels.

Extra Equipment:

- Waste containers, big bags, bins, plastic bags; and
- Front-end loader (for disposal).

PPE: At least protective clothing: overalls, boots, gloves, etc. depending on the nature of the pollutant, expose and responder activity.

- Divide the response personnel among three functions:
 - Collection/scraping/gathering
 - Placing in bags/waste containers
 - Disposal
- Rotate the teams among the three functions;
- The waste can be disposed of manually or with the use of mechanical means if possible;
- Don't overfill bins, plastic bags; and
- Don't remove excessive quantities of sediments.

Impact

- Impact insignificant to heavy, depending on the type of substrate. Risk of destroying the structure of the substrate in marshes. Erosion;
- Potentially destructive effects on vegetation (dunes, marshland);
- Deconstruction and destabilisation of the foot of the dune (upper end of beach); erosion, destruction of the dune and the associated vegetation, decrease in biodiversity and fertility by reduction of the low water mark; and
- Can tend to fragment the oil in certain conditions.

Performance

This is a highly selective technique, but requires a lot of time and personnel. If not done correctly, there is a risk of removal of large quantities of clean sediment.

L-3 Mechanical clean-up guidelines

This technique consists of collecting the oil in order to facilitate its removal from the beach. Collection is carried out using a tractor, ATV or earthmoving vehicle or earthmoving equipment.

Conditions of use

- Pollution : heavy pollution, continuous slick;
- Pollutant : slightly to very viscous oil;
- Substrate : vast, flat foreshore with wet fine-grain sand (very damp to saturated) and a good load-bearing capacity, without ripple marks; and
- Site: accessible and sufficient load bearing capacity for earthmoving equipment, sufficiently large to allow vehicles to manoeuvre.

Equipment

Basic equipment:

- Backhoe loader;
- Grader/bulldozer;
- Tractor or loader with front blade; and
- Front-end loader or lorry (for removal).
- PPE: At least suitable for heavy machinery operation

Impact

- Normally only removes the oil, but some sediment may also be taken with it (if the operator is poorly supervised or inexperienced), especially if used on light pollution or an unsuitable site;
- High risk of disturbance due to traffic and mixing of oil with sediment; and
- May lead to reduction of beach stability and beach erosion/loss of beach area.

Minimum workforce required: 2 people per vehicle (1 drive + 1 assistant).

Waste: oil mixed with a varying quantity of sediment; but can rapidly become unselective if scraping is carried out on moderate pollution (should be avoided).

- Consists of bringing the oil together in order to facilitate its removal from the beach. Scraping is carried out using a tractor or earthmoving equipment fitted with a front end blade in an oblique position. According to the viscosity of the oil, two options are available:
 - (case 1) fluid oil: radial or converging scraping towards a collection point on the foreshore; removal by pumping
 - (case 2) more viscous oil /solids: concentration to form windrows, by successive slightly curving passes parallel to the water line; subsequent removal of windrows
- Should only be carried out on heavy pollution; do not use on moderate to light pollution
- Inform and supervise operators; use experienced operators
- Work methodically
- Set up traffic lanes on the beach in order to reduce oil and sediment mixing
- Don't remove excessive amounts of non-contaminated materials
- Don't fill the bucket of loader more than 2/3 capacity
- Don't drive on polluted materials

L-4 Shoreline vessel access guidelines

There are numerous landing craft vessels available in the North West Shelf area. These vessels are capable of grounding out; therefore the vessels can access a contacted area on high tide, ground out, unload equipment and personnel, reload with waste oil then depart on the next high tide. The Santos Offshore - Vessel Requirements for Oil Spill Response (7710-650-ERP-0001) describes the specifications for beach landing craft, and describes Santos vessel monitoring processes.

Mechanical equipment and PPE are to be mobilised to the nominated marine operational base for onward movement to the affected locations.

For shoreline clean-up of remote islands, the following guidelines will be considered so as to minimise the secondary impacts of high numbers of spill response personnel on shorelines:

Vessels are to be mobilised to the designated deployment Port to mobilise shoreline clean-up teams by water. The shoreline clean-up will be undertaken through on-water deployment to the defined shorelines in 4 stages:

- 1) Drop off of 6-person clean-up containers to shoreline contact locations defined by IMT through observation data;
- 2) Deployment of marine and environmental specialists to demarcate the clean-up zones with barrier posts and tape to prevent secondary contamination impacts to flora and fauna by the clean-up teams;
- 3) Deployment of small clean-up teams with a trained/competent shoreline responder as a Team Leader to conduct clean-up methods (flushing, bag and retrieve, etc.) with all waste being bagged and stored in temporary bunding made of HDPE above the high-tide mark; and
- 4) Deployment of waste pickup barges to retrieve collected wastes from the temporary bunding and to complete the shoreline clean-up and final polishing.

Appendix M Resourcing Requirements For OM6: Shoreline Clean-Up Assessment

Shoreline clean-up assessment teams will comprise two to three members per team and are assumed to be able to cover 10 km per team per day. Teams may be able to exceed this distance, especially if remote sensing techniques (e.g. UAVs) are employed to cover shorelines that have access limitations, which includes many receptor locations in the EMBA.

Santos has used both stochastic and deterministic modelling data for shoreline contact to plan for the worst-case shoreline and habitat assessment personnel requirements. Table M- 1 presents all receptors contacted at ≥ 100 g/m² using the stochastic modelling results for the LOWC scenario along with the SCAT planning considerations and estimated number of SCAT teams required.

It should be noted that not all of the receptors listed in Table M- 1 will be contacted by one single spill. These results are presenting the range of possible worst-case timeframes to contact and length contacted based on all runs that make up the stochastic models from each operational area. Santos will use initial monitor and evaluate data (e.g. trajectory modelling and aerial surveillance) to determine where resources should be allocated. This may include directing resources to conduct SCAT at locations not identified as protection priority areas, to determine if protection and clean-up activities may be required at these receptors. Initially, shoreline clean-up assessment may be conducted via reconnaissance surveys and later confirmed via ground and/or vessel surveys.

Deterministic run 33 was selected to further guide resourcing estimates for SCAT given this run resulted in the greatest length of shoreline accumulation (Table M-2). Based on deterministic run 33 for the LOWC scenario the worst-case personnel requirements for SCAT for this activity are for 30-45 personnel based on 15 teams (1 Team Leader and 1–2 Team Members per team). Although this involves a large number of teams, contact times are long (greater than 23 days), allowing adequate time to plan and allocate resources effectively.

Table M-3 provides the resource capability available to Santos that may be used to implement SCAT.

Table M- 1: Resource requirements for shoreline clean-up assessment for contacted receptors ≥ 100 g/m² based on the LOWC scenario stochastic modelling

Location	Minimum arrival time shoreline oil accumulation ≥ 100 g/m ² (hours / days)	Maximum length of shoreline oiled (km) ≥ 100 g/m ²	Estimated No. of teams required
Barrow Island	700 (29 days 4 hours)	38	2
Broome Roebuck	1,824 (76 days)	6	1
Broome North Coast	2,163 (90 days, 3 hours)	2	1
Carnarvon - Inner Shark Bay	1,677 (69 days, 21 hours)	4	1
Christmas Island	2,084 (86 d, 20 hrs)	1	1
Clerke Reef MP	1,859 (77 d, 11 hrs)	2	1
Dampier Archipelago	1,045 (43 days, 13 hrs)	36	2
Eighty Mile Beach	1,971 (74 days, 15 hours)	9	1
Exmouth Gulf Coast	914 (38 days, 2 hours)	23	1
Imperieuse Reef	1,366 (56 days, 22 hours)	11	1
Lowendal Islands	749 (31 days, 5 hours 30)	9	1
Middle Islands Coast	1,128 (47 days)	42	2
Montebello Islands	738 (30 days, 18 hours)	25	1
Muiron Islands	747 (31 days, 3 hours)	15	1
Ningaloo Coast North	565 (23 days, 13 hours)	160	4
Ningaloo Coast South	1,682 (70 days, 2 hours)	2	1
Northern Islands Coast	761 (31 days, 17 hours)	32	2
Port Hedland Eighty Mile Beach	1,610 (67 days, 2 hours)	1	1

Location	Minimum arrival time shoreline oil accumulation ≥ 100 g/m ² (hours / days)	Maximum length of shoreline oiled (km) ≥ 100 g/m ²	Estimated No. of teams required
Roebuck-Eighty Mile Beach	1,776 (74 days)	40	2
Scott Reef South	2,009 (83 days, 17 hours)	8	1
Shark Bay - Coast Outer	1,574 (65 days, 14 hours)	37	2
Southern Islands Coast	769 (32 days, 1 hour)	99	2
Thevenard Islands	895 (37 days, 7 hours)	14	1

Source: RPS (2025)

Table M-2: Resource requirements for shoreline clean-up assessment for contacted receptors ≥ 100 g/m² based on deterministic modelling – run 33 from the LOWC scenario

Location	Minimum arrival time shoreline oil accumulation ≥ 100 g/m ² (hours / days)	Maximum length of shoreline oiled (km) ≥ 100 g/m ²	Estimated No. of teams required
Barrow Island	1,785 (74 days, 9 hours)	30	2
Exmouth Gulf Coast	1,231 (51 days, 7 hours)	12	1
Middle Islands Coast	1,264 (52 days, 16 hours)	42	2
Montebello Islands	1,475 (61 days, 11 hours)	1	1
Muiron Islands	1,181 (49 days, 5 hours)	13	1
Ningaloo Coast North	1,193 (49 days, 17 hours)	160	4
Northern Islands Coast	1,456 (60 days, 16 hours)	17	1
Southern Islands Coast	1,185 (49 days, 9 hours)	73	2
Thevenard Islands	1,233 (51 days, 9 hours)	14	1
Total:			15

Table M-3: Shoreline clean-up assessment – resource capability

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
Shoreline assessment team leaders	Santos	12	Perth, Varanus Island	24-72 hours from time of shoreline contact prediction (WA-based, Santos personnel, AMOSC staff and Core Group personnel)
	AMOSC Core Group	As per monthly availability	Perth, Dampier and other Australian locations	
	AMOSC staff	12 trained in SCAT	Perth and Geelong	
	OSRL	18	Perth and international	
Shoreline assessment team members	Santos contracted work force hire company (e.g. Dare)	As per availability (up to 2,000)	Australia wide	Subject to availability (indicatively 72+ hours)
Drones and pilots ** To assist shoreline and vessel-based surveillance	AMOSC	Drones available 24/7 through AMOSC sub-contract 3 x pilots	Fremantle and Geelong	Response via duty officer within 15 minutes of first call – AMOSC personnel available within 1 hour of initial activation call. Equipment logistics varies according to

Equipment Type/Personnel Required	Organisation	Quantity Available	Location	Mobilisation Timeframe
				stockpile location (refer to Table 10-12)
	OSRL – Third Party UAV provider	2 x qualified remote pilots, however response is on best endeavours basis	Perth	Depending on the port of departure, 1–2 days if within Australia
	Local WA hire companies	10+	Perth and regional WA	<48 hours

Appendix N Operational and scientific monitoring assessment

The North West Shelf OSM Bridging Implementation Plan (OSM-BIP) (7715-650-ERP-0002) defines the 3-step process for ensuring that OSM priorities and capabilities of each activity are adequately covered by the existing information described within the North West Shelf OSM-BIP (Section 1.1 and Appendix A of the North West Shelf OSM-BIP).

Step 1: Determine if the new activity Scientific Monitoring Planning Area fits within the North West Shelf OSM-BIP consolidated Scientific Monitoring Planning Area

Comparison of the Scientific Monitoring Planning Area for VGA-4H GI ST1 well suspension / decommissioning activities (Figure N-1) shows that this fits within the North West Shelf OSM-BIP consolidated Scientific Monitoring Planning Area (Figure 2-1 in the North West Shelf OSM-BIP).

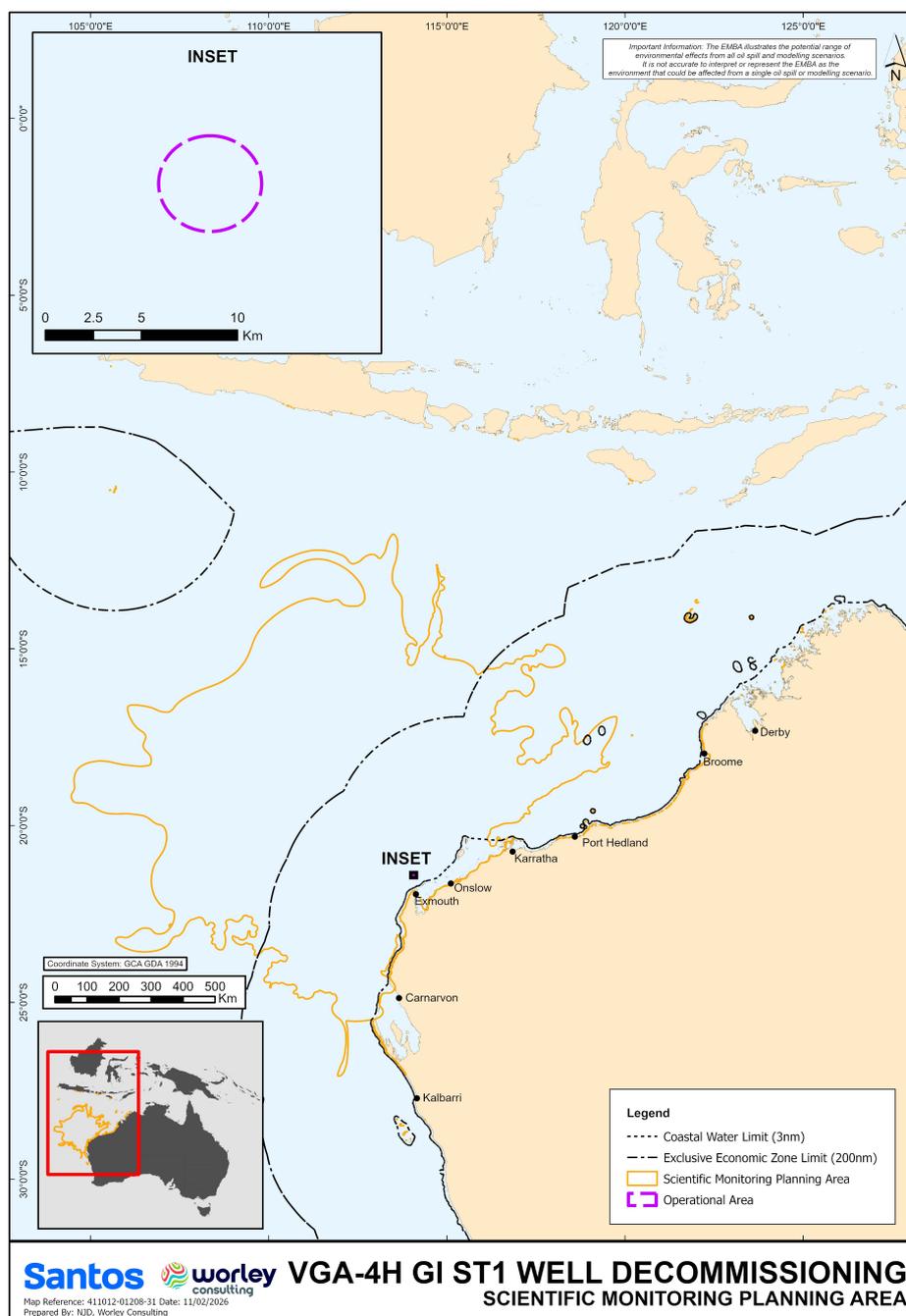


Figure N-1: Scientific Monitoring Planning Area for the VGA-4H GI ST1 Well Suspension / Decommissioning EP ([7745-236-EMP-0001])

Step 2: Determine monitoring priorities for the activity, by identifying receptors predicted to be contacted $\geq 5\%$ probability within 7 days, determining whether these receptors are already noted as monitoring priorities in Section 2 and have been assessed for baseline data adequacy in Section 4 of the North West Shelf OSM-BIP

As per Section 2.2 of the North West Shelf OSM-BIP, monitoring prioritisation during a spill should focus on sensitive receptors (which Santos identifies through its Oil Spill Risk Assessment and Response Planning Procedure [SO-91-II-20003]) with the highest risk of adverse consequences and where oil spill modelling predicts high probability of rapid contact. Additionally, receptors that have little to no existing baseline are given a higher scientific monitoring priority.

The monitoring priorities for VGA-4H GI ST1 well suspension / decommissioning activities include sensitive receptors contacted by hydrocarbons at either the low threshold for floating (≥ 1 g/m²), shoreline contact (≥ 10 g/m²), entrained (≥ 10 ppb), or dissolved (≥ 10 ppb) within 7 days at a probability $> 5\%$, as identified in Table N-1 and Table N-2. These receptors are all included in Table 2-1 of the North West Shelf OSM-BIP and have therefore been assessed for baseline data adequacy and also in the background information for key sensitivities (Appendix C of the North West Shelf OSM-BIP).

The results of the baseline data assessment for these monitoring priorities are provided in Table N-3, which is an excerpt from Table 4-3 of the North West Shelf OSM-BIP (but only includes monitoring priorities for VGA-4H GI ST1 well suspension / decommissioning activities).

Stochastic modelling of the LOWC scenario (Table N-1) did not predict any sensitive receptors to be contacted by floating, shoreline or dissolved hydrocarbons at low thresholds within 7 days for the LOWC scenario, but did predict 1 receptor contacted for entrained oil.

Stochastic modelling of the MDO scenarios predicted a limited number of submerged receptors meeting the criteria of $> 5\%$ probability of contact within 7 days for floating, entrained and dissolved oil. However, the criteria was not met for shoreline accumulation (refer to Table N-2). The inclusion of entrained hydrocarbons at concentrations greater than 10 ppb is used to denote exposure to hydrocarbons, but does not necessarily imply toxicity. For entrained whole-oil droplets, the toxic fraction is small, as many hydrocarbon constituents remain sequestered and not bioavailable (French-McCay 2025). During the initial monitoring response, emphasis will be placed on receptors contacted by floating, shoreline, and dissolved hydrocarbon phases. If a receptor is only contacted by low concentrations of entrained hydrocarbons and not by any other hydrocarbon phase, it will be considered a lower priority during the initial monitoring response.

Step 3: Determine whether the capability requirements and monitoring arrangements of the activity exceed or are met by the capability requirements outlined in Section 8 and capability arrangements described in Sections 9 and 10 of the North West Shelf OSM-BIP

As per Step 3, Appendix B of the North West Shelf OSM-BIP, Santos has reviewed the following worst-case OSM capability assessment criteria for VGA-4H GI ST1 well suspension / decommissioning activities:

- *Review stochastic modelling results to determine if more than 8 floating, 6 shoreline or 12 dissolved locations are contacted within 7 days:* Tables N-1 and N-2 show that 1 floating and no shoreline receptors are contacted by either the LOWC (Van Gogh Crude) or vessel collision (MDO) spills within 7 days at a probability $> 5\%$. Similarly, Tables N-1 and N-2 show only 1 dissolved receptor is contacted by the MDO scenario within 7 days at a probability $> 5\%$, but none from the LOWC scenario.
- *Is the hydrocarbon type adequately represented in the existing suite of hydrocarbons analysed in Section 8 of the OSM-BIP:* Section 8 of the OSM-BIP (Resourcing requirements) includes analysis of an HFO (Group 4) spill as informing the worst-case OSM capability, which adequately represents Van Gogh Crude (also a Group 4).

Both the above assessment criteria are met for the VGA-4H GI ST1 well suspension / decommissioning activities, and therefore specific deterministic modelling is not required to inform initial capability assessment. In addition, the VGA-4H GI ST1 well suspension / decommissioning activity is already included in the consideration of worst-case spill scenarios in the OSM-BIP in Section 2.2 (Table 2-1) and therefore the capabilities described in the North West Shelf OSM-BIP cover the VGA-4H GI ST1 well suspension / decommissioning activity.

The results of the baseline assessment are provided within the Environment Functional Team Folder on the [Santos ER SharePoint](#) so that this information is accessible to guide Santos IMT Environmental roles and OSM Services Provider roles in the event of activating oil spill scientific monitoring.

Table N-1: LOWC release of Van Gogh crude - stochastic modelling results for locations with a probability of contact >5% and <14 days

Floating oil contact locations	Contact probability (%) floating oil ≥ 1 g/m ²	Minimum arrival time ≥ 1 g/m ²
Ningaloo Offshore	100	13 days, 8 hours
Shoreline contact locations	Contact probably (%) Shoreline oil ≥ 10 g/m ²	Minimum arrival time ≥ 10 g/m ²
Barrow Island	13.32	11 days, 16 hours
Ningaloo Coast North	28.31	9 days, 4 hours
Southern Islands Coast	12.99	11 days, 13 hours
Thevenard Islands	7.33	10 days, 6 hours
Entrained hydrocarbon contact locations	Contact probably (%) entrained oil ≥ 10 ppb	Minimum arrival time ≥ 10 ppb
Ningaloo Offshore	99.9	9 hours
Dissolved hydrocarbon contact locations	Contact probably (%) dissolved hydrocarbons ≥ 10 ppb	Minimum arrival time ≥ 10 ppb
<i>No dissolved hydrocarbon exposure was predicted by the modelling at or above the low threshold of 10 ppb</i>		

Source: RPS (2025)

= submerged receptor

Table N-2: Vessel collision release of MDO - stochastic modelling results for locations with a probability of contact >5% and <7 days

Floating hydrocarbon contact locations	Contact probably (%) floating oil ≥ 10 ppb	Minimum arrival time ≥ 10 ppb
Ningaloo – Outer NW	6.33	4 hours
Shoreline contact locations	Contact probably (%) Shoreline oil ≥ 10 g/m ²	Minimum arrival time ≥ 10 g/m ²
<i>No shoreline accumulation exposure was predicted by the modelling ≥ 10 g/m²</i>		
Entrained hydrocarbon contact locations	Contact probably (%) entrained oil ≥ 10 ppb	Minimum arrival time ≥ 10 ppb
Gascoyne AMP	10.33	2 days, 7 hours
Ningaloo Offshore	85.67	1 hour
Ningaloo – Outer Coast North	7.67	1 day, 22 hours
Ningaloo – Outer NW	53	3 hours
Dissolved hydrocarbon contact locations	Contact probably (%) dissolved oil ≥ 10 ppb	Minimum arrival time ≥ 10 ppb
Ningaloo – Outer NW	16.67	4 hours

Source: RPS (2024)

= submerged receptor

Table N-3: Baseline data assessment for VGA-4H GI ST1 Well Suspension / Decommissioning activities - monitoring priorities versus SMPs

Receptor	SMP									
	SM1: Water quality impact	SM2: Sediment quality impact	SM3: Intertidal and coastal habitat	SM4: Seabirds and shorebirds	SM5: Marine mega-fauna assessment – reptiles	SM5: Marine mega-fauna assessment – whale sharks, dugong and cetaceans	SM6: Benthic habitat	SM7: Marine fish and elasmobranch assemblages	SM8: Fisheries impact ⁺	SM9 & 10: Heritage and social impact [^]
Gascoyne AMP*			N/A							
Ningaloo Coast North (includes Ningaloo World Heritage Area and Ningaloo Offshore Areas*)					Turtle	Whale shark				
Key										
	Priority survey: Current baseline data is not in place, not suitable or not sufficient; and post-spill pre-impact baseline data collection should be prioritised									
	Survey: Collectively there is substantial baseline data or on-going monitoring from within the last 5 years, therefore current monitoring/knowledge is considered adequate (i.e. could be used to detect level of change in the event of a significant impact) and is considered a lower priority for post-spill, pre-impact data collection									
	N/A: not applicable									

* Submerged EVA.

+ Locations to be determined in consultation with key stakeholders to reflect current fishing zones/effort.

^ Locations to be determined in consultation with key stakeholders.

Appendix O Forward Operations Guidance

The IMT operate from Perth within the Santos IMT room. These rooms are equipped and subject to reviews and updates as detailed in the Santos Incident Management Plan – WANATL (7700-670-PLA-0016).

For a significant Level 2/3 response requiring coordination of resources to be deployed to the field, Santos will establish a forward operations base (FOB). For a Level 2/3 spill crossing from Commonwealth to State waters (cross-jurisdictional spills) DTMI will establish an FOB.

To facilitate a streamlined response, FOBs are required close to the response operational areas equipped with near duplicated IMT equipment and personnel. Further information on FOBs is provided in the Santos Oil Spill Response – Forward Operating Base Guideline (7700-670-PRO-0092).

For the VGA-4H GI ST1 Well Suspension / Decommissioning activities spill response, Santos may establish an FOB at the Exmouth Volunteer Marine Rescue building on Madaffari Drive, Exmouth, and the forward staging area at Exmouth Freight and Logistics, who currently provide transport and logistical services for Santos. In addition, Santos has first strike response equipment (dispersant spray units, dispersant test kits, oil spill boom) already located at Exmouth Freight and Logistics and access to trained personnel to support the operation of the equipment. There are also three other potential FOB locations within the Exmouth region:

- SES Emergency Centre;
- Building 142 of the Harold E Holt Naval Base; and
- The Ningaloo Centre.

Additional FOBs may be set up as operational requirements dictate. Based on shoreline areas that might be impacted, potential additional FOB locations include Dampier (Toll Dampier Supply Base, Yard 4).

Refer to Santos Oil Spill Response – Forward Operating Base Guideline (7700-670-PRO-0092) for details on the potential FOB locations.

Appendix P Oiled Wildlife Response Personnel and Equipment

In the event of a spill impacting wildlife, Santos will commence arrangements to mobilise personnel and equipment to fill responder positions as identified in the Santos Oiled Wildlife Response Framework Plan (7700-650-PLA-0017) and WAOWRP.

This appendix outlines the current OWR equipment, personnel and services available to Santos through current arrangements.

Overall OWR capability per OWR strategy

The overall OWR capability of Santos is outlined in Table P-1. Santos has access to aircraft that could be used for wildlife reconnaissance within hours of a spill. This would be followed by further access to vessels and Santos personnel trained in OWR that could be mobilised within 24 hours for vessel and wildlife shoreline reconnaissance, demonstrating Santos’ ability to mount a swift response that could also be sustained for as long as required.

Santos has the capability to set up oiled wildlife field stations within 3–4 days of a spill through access to AMOSC equipment and equipment purchased at the time of a spill. Santos could also arrange the transport of wildlife from the field to a primary care facility. In the unlikely event that a worst-case LOWC situation is realised, there is the potential for OWR impacts in offshore remote islands. There are additional logistical constraints to OWR in these environments, which are considered in Table P-2. Specifications for vessels that could be used as offshore OWR field stations are also considered in the Santos Marine Vessel Requirements for Oil Spill Response (7710-650-ERP-0001).

The indicative personnel required for a high impact-rated response is 93 personnel (as per the WAOWRP) (DBCA, 2022a), however depending on the number and species impacted, many more may be required. Santos’ current arrangements could support a large scale OWR (requiring >93 personnel) mainly through support staff such as non-technical wildlife support roles (management, logistics, planning, human resourcing, transport, cleaners, trades persons, security etc). These roles could be filled by Santos personnel and labour hire agencies that can provide workers that undergo an induction and basic training. In addition, many of the roles required for an OWR require technical expertise and Santos will need to activate OWR arrangements with AMOSC and OSRL to fulfil roles, as well as make contractor arrangements for accessing skilled wildlife personnel at the time of a spill.

Table P-1: Santos OWR capability per OWR strategy

OWR Strategy	Considerations	Equipment/Personnel	Location	Mobilisation Timeframe
Reconnaissance	Identify opportunities to create synergies with surveys required for Monitor and Evaluate, and Operational and Scientific Monitoring activities.	Rotary Wing Aircraft & Flight Crew	Karratha	Wheels up within 1 hour for ER
		Drones and pilots	Local WA hire companies	1-2 days
		Contracted vessels and VOO Santos Contracted Vessel Providers VOO identified through AIS Vessel Tracking	Vessels mobilised from Exmouth or Dampier. Locations verified through AIS Vessel Tracking Software.	Pending availability and location Expected within 12 hours
		Aerial Surveillance Crew Santos Staff AMOSC Staff AMOSC Core Group personnel available Additional trained industry mutual aid personnel available	Perth and Varanus Island (Santos aerial observers) Australia wide	Santos trained personnel – next day mobilisation to airbase <24 hours
Preventative actions	Mainly effective for bird species Requires relevant WA licence approval	2x AMOSC wildlife fauna hazing and exclusion kits 1x AMOSC Bird scarer	1x Fremantle, 1x Geelong 1x Fremantle	Location dependent

OWR Strategy	Considerations	Equipment/Personnel	Location	Mobilisation Timeframe
Rescue and field processing	Wildlife handling and first aid should only be done by persons with appropriate skills and experience or under the direction of DBCA. A beach access support vessel or accommodation vessel could be used for field processing in remote locations (benefits associated with temperature regulation and access to heated water and electricity)	2x AMOSC oiled fauna kits (basic medical supplies, cleaning/rehab, PPE)	1x Exmouth, 1x Broome	Location dependent
		2 x OWR First Strike Response Kits	1x Fremantle, 1x Geelong	Location dependent
		2x DBCA OWR trailers	1x Kensington WA, 1x Karratha	Location dependent
		50% of OSRL OWR response packages (wildlife search and rescue kits/cleaning and rehab kits, including field first aid).	5x Singapore, 3x Bahrain, 7x UK, 5x Fort Lauderdale	Location dependent
Transport	Transport of oiled animals by aeroplane or helicopter may be restricted due to Civil Aviation Safety Authority (CASA) regulations. Such transport will depend on the level of oiling remaining on animals. Therefore, consultation with the air transport provider must take place before transport to ensure the safest and most efficient means.	Contracted vessels and VOO Santos Contracted Vessel Providers VOO identified through AIS Vessel Tracking	Vessels mobilised from Exmouth or Dampier. Locations verified through AIS Vessel Tracking Software.	Pending availability and location Expected within 12 hours
Primary care facility	OWR container could be placed on the deck of a suitably sized vessel for field processing in remote locations (benefits associated with temperature regulation and access to water and electricity). An OWR container on a vessel could also be used to aide transport form offshore islands.	OWR container/mobile washing facility: 2x AMOSC 4x AMSA 2x DTMI	AMOSC – 1x Fremantle, 1x Geelong AMSA – 1x Dampier, 1x Darwin, 1x Devonport, 1x Townsville DTMI – 2x Fremantle (1 x Primary Care Kit [20ft container]; 1 x Sustainment Kit [20ft container])	Location dependent
Personnel	Untrained personnel would receive an induction, on-the-job training and work under the supervision of an experienced supervisor.	Santos provides OWR training to staff, and to-date, 16 personnel have received OWR training.	Perth and Varanus Island	<48 hours
		Santos maintains labour hire arrangements for access to untrained personnel.		
		2 x AMOSC OWA	Perth	<48 hours
		~90 x trained industry personnel (AMOSC	-	<48 hours

OWR Strategy	Considerations	Equipment/Personnel	Location	Mobilisation Timeframe
		OWR Strike Team members)		
		AMOSOC MOU with Phillip Island National Park (PINP) (best-endeavours availability)	Victoria	Best-endeavour availability
		AMOSOC – Supporting NGOs	WA	Best-endeavour availability
		AMOSOC call off contract with DWYERTech NZ – a facilities management group	New Zealand	Availability within 24 hours of call-off
	<p>Sea Alarm</p> <p>Via OSRL’s contract with the Sea Alarm Foundation, two oiled wildlife response technical advisors are on call to support Members.</p> <p>Sea Alarm staff act in a technical advisory role and do not engage in hands-on OWR activities but work impartially with all parties (titleholder, local authorities, mobilised experts and local experts, and response groups), aiming to maximise the effectiveness of the wildlife response.</p>	<p>1 x OWR Technical Advisor available for deployment in-field or at the Command Post (typically supporting the Wildlife Branch Director or the Planning and Operations sections)</p> <p>1 x OWR Technical Advisor available to support remotely.</p>	Sea Alarm Belgium	Location dependent. Notification via existing OSRL notification and mobilisation process.
	<p>GOWRS Oiled Wildlife Assessment Service</p> <p>Through OSRL’s ongoing funding of the Global Oiled Wildlife Response System (GOWRS) project, a wildlife assessment team of four wildlife experts can be mobilised in-field to provide an on-the-ground technical assessment of wildlife response needs and the professional capabilities of local responders.</p>	<p>4 x wildlife experts can be mobilised in-field for up to 4 days.</p> <p>Access to additional oiled wildlife resources on a ‘reasonable endeavours’ only basis through the GOWRS partners</p>	Various locations in northern and southern hemisphere	Location dependent. Notification via existing OSRL notification and mobilisation process.

Table P-2: Logistical considerations for implementing an OWR in remote offshore locations

OWR Strategy	Logistical Considerations
Reconnaissance and rescue	<p>Along the Ningaloo Coast North, the fringing reef and turtle nesting beaches are highly sensitive to disturbance, with access constrained by limited tracks and tidal windows (DCCEEW, 2009). At the Muiron Islands, steep beach profiles, exposed reef flats and restricted landing points make shoreline clean-up logistically challenging, while also increasing the risk of secondary impacts to turtle nesting sites (DoE 2006; CALM 2005). Exmouth Gulf shores support extensive mangroves and intertidal flats that are difficult to access and where intrusive clean-up methods could cause greater long-term damage than oiling itself (EPA 2022). The Southern Islands, Middle Islands and Thevenard Islands are remote cays and low-lying islands exposed to swell and tidal surges, with limited infrastructure for staging, storage or waste removal. Barrow Island has shallow bathymetry that results in large areas of exposed seabed at low tide and strong currents persists close to the islands (Chevron Australia 2014). In addition, much of the coastline is remote and inaccessible via road, making many shoreline clean-up techniques difficult and their use may result in greater environmental impacts. In addition, the remote nature, potential presence of dangerous fauna (i.e. saltwater crocodiles and Irukandji jellyfish) present significant safety risks to responders working in these environments.</p>
OWR Field station	<p>Vessel minimum specifications:</p> <ul style="list-style-type: none"> • Suitable deck area for: <ul style="list-style-type: none"> – 1 x OWR container (e.g. AMOSC, AMSA) and small tender vessel – 1-2 air conditioned animal holding containers • Oily water separator and/or waste oily water holding tanks • Accommodation for 10 minimum OWR personnel (including personnel for reconnaissance, rescue and field processing). • Personnel transfer basket for transferring personnel and wildlife from smaller vessels to the field station vessel (adult sized turtles may require a hiab for transfer). Transfer is metocean condition dependent - only to be undertaken in suitable conditions. <p>Refer to Figure P-4-3 in the WA OWR Manual (DBCA, 2022b) for an example layout for a vessel-based OW facility and Appendix A of the WA OWR Plan (DBCA, 2022a) for associated equipment lists.</p> <p>Vessel based wildlife field station:</p> <ul style="list-style-type: none"> • 1 x OWR container for undertaking wildlife assessments and triage • 1 x OWR container for washing, or as a holding room if washing is not undertaken (situation dependent) <ul style="list-style-type: none"> – Consideration may be given to washing lightly oiled but otherwise normal turtles (Stacey <i>et al.</i> 2019) if they can be returned to an unoiled marine environment quickly – Oiled birds should not be washed in the field unless necessary for transport (refer to transport considerations below) – Seawater is effective for washing oiled wildlife (Finlayson <i>et al.</i> 2018) and could be used for cleaning onboard a vessel if required. • If an OWR container is not available or is not large enough, a temporary holding area could be placed on the deck of the field station vessel (e.g. airconditioned container/demountable) <ul style="list-style-type: none"> – The holding area will need sufficient room (subject to the number of wildlife and species requirements) to hold wildlife for 2 to 5 days (allowing for weather and wildlife stabilisation) before transport – Will need to be enclosed – Will require ventilation – Will be advantageous if this is a climate controlled area (air conditioners/fans/heaters utilising vessel power source). • Carcass storage requirements: <ul style="list-style-type: none"> – Refrigerators/freezers (refer to Section 4.4 of the WA OWR Manual [DBCA, 2022b]) – Refrigeration of carcasses if necropsy is feasible in <24 hours (unlikely given the remote location) – Freeze carcasses if necropsy will occur >24 hours. <p><i>Note: These vessel specifications are included in the Santos Marine Vessel Requirements for Oil Spill Response (7710-650-ERP-0001)</i></p>
Transport	<p>Helicopter:</p> <ul style="list-style-type: none"> • Could be an option if the vessel has a helideck. • Transport of oiled animals by aeroplane or helicopter may be restricted due to Civil Aviation Safety Authority (CASA) regulations; such transport will depend on the level of oiling remaining on animals.

	Therefore, consultation with the air transport provider must take place before transport to ensure the safest and most efficient means of transport. Vessel transport to mainland via dedicated transport vessel – transit time is location dependent.
Primary care facility	<ul style="list-style-type: none"> • Arrangements via AMOSC and DBCA for setting up a Primary Care Facility in Dampier, Exmouth or utilising existing rehabilitation facilities (if affected wildlife numbers are low) • Santos will be responsible for resourcing the facility.

Australian Maritime Safety Authority

AMSA maintains four oiled wildlife response containers/mobile washing facilities in Dampier, Darwin, Devonport and Townsville. All resources under the National Plan (including the four OWR containers) are available to Santos through formal request to AMSA under the arrangements of the National Plan. The containers also include some limited PPE and fresh and wastewater pools.

Western Australian Department of Transport and Major Infrastructure

The WA DTMI maintains two OWR containers (located at Port of Fremantle in D-shed) which are available through the SHP-MEE and the AMSA National Plan on request.

Australian Marine Oil Spill Centre

Santos is a participating member of AMOSC and as such has access to AMOSC's Level 2/3 oiled wildlife equipment and personnel as outlined in the AMOSPlan and the AMOSC OWR State board.

Equipment

Table P-2 provides a summary of the oiled wildlife response equipment maintained by AMOSC.

Table P-2: AMOSC wildlife equipment

Location	Oiled fauna kits (basic medical supplies, cleaning/rehab, PPE)	Fauna hazing and exclusion equipment	Oiled wildlife washdown container (mobile washing facility)
Fremantle	1x oiled fauna first strike response kit	1x fauna hazing & exclusion kit 1x Bird Scarer	1x oiled wildlife washdown container
Exmouth	1x oiled fauna kit	-	-
Broome	1x oiled fauna kit	-	-
Geelong	1x oiled fauna first strike response kit	1x fauna hazing & exclusion kit	1x oiled wildlife washdown container
Total	4x Oiled fauna kit	2x fauna hazing & exclusion kits 1x Bird scarer	2x oiled wildlife washdown containers

Personnel

AMOSC currently has the following arrangements in place for OWR personnel:

- 2x AMOSC OWR personnel available to act as an industry OWA.
- ~90x trained industry personnel (AMOSC OWR Strike Team members).
 - ~53 introductory trained personnel.
 - ~37 management trained personnel
- AMOSC call off contract with DWYERtech Response NZ.

- A facilities management group with availability within 24 hours of call off (2x personnel).

AMOSOC has an MoU with Phillip Island Nature Park (PINP):

- PINP (best-endeavours availability):
 - Approx. 50x PINP Staff – collection/facility ops/rehabilitation.
 - Approx. 45x volunteers – collection/facility ops/rehabilitation.
 - Approx. 20x staff (animal feeding).
 - 6x PINP Staff – wildlife ER including cetacean stranding/entanglement.
 - 17x PINP Staff – wildlife team leaders.
 - 5x PINP Staff – IMT Training.

Supporting Non-Government Organisations (NGO) in WA:

- Seabird Rescue (South-west area).
 - Subject Matter Expert (SME) - Avifauna rescue, rehabilitation and release.
 - Volunteer based rescue and rehabilitation service for seabirds and waterbirds statewide of Western Australia.
- Native Animal Rescue (NAR).
 - Perth Base:
 - All native WA Wildlife.
 - Registered wildlife hospital
 - Rescue/ animal handling/ Facility Ops./ Rehabilitation – Volunteers & NAR Staff
 - Broome Base:
 - Reptiles – Snakes and turtles
 - Seabirds
 - Rescue, Animal handling
- WA Wildlife (Perth).
 - SME in terrestrial mammals and avifauna washing and rehabilitation.
 - Licensed wildlife veterinary hospital and rehabilitation centre under the *Biodiversity Conservation Act 2016*, *Veterinary practice Act 2021* and is available for activation 24 hours a day, 7 days a week.
 - Trained wildlife responders, veterinarians and veterinary nurses.
- Darling Range Wildlife Shelter (Perth).
 - WA native wildlife
 - Rescue/ Animal handling/ Facility Ops./ Rehabilitation
 - Volunteers and Staff
- Mandurah Wildlife (South-west WA).
- Nocterra (Perth – Office, Barrow Island – Field)
 - SME in marine turtles and avifauna
 - Rescue/ handling/ monitoring
 - Volunteer based.

Oil Spill Response Limited

Through the associate membership, Santos has access to the following OWR equipment and personnel services from OSRL.

Equipment

OSRL maintains a Level 3 wildlife equipment stockpile. This equipment is stored across the OSRL base locations and is designed to support the first 48 hours of the response and to ensure availability of critical equipment items that may be difficult to source locally (note: this equipment does not provide everything that will be required to successfully operate a primary care facility and is focussed primarily on bird casualties (n=100)). Equipment is sorted according to search and rescue (including field first aid), medical, cleaning and rehabilitation (Table P-3).

Table P-3: OSRL wildlife equipment (as per OSRL Equipment Stockpile Status Report, January 2026)

OWR Response Package	UK	Singapore	Bahrain	Fort Lauderdale
Wildlife Search and Rescue BHR	-	-	-	-
Wildlife Cleaning and Rehabilitation Part 1	2	1	1	1
Wildlife Cleaning and Rehabilitation Part 2	2	1	-	1
Wildlife Cleaning and Rehabilitation Medical	1	1	1	1
Wildlife Search and Capture	1	1	1	1
Wildlife Search and Capture Medical	1	1	-	1

The latest OSRL equipment inventory available to members can be found in the [SLA equipment stockpile status report: https://www.osrl.com/in-action/publications/](https://www.osrl.com/in-action/publications/).

Personnel

Through the OSRL SLA, Santos has access to 24/7 technical advice (remote or on-site) from the Sea Alarm Foundation, a small non-governmental organisation based in Brussels, Belgium that works to improve global preparedness and response for oiled wildlife incidents. 2 x Technical Advisors are available, with one providing remote support and the other available to be mobilised for on-site support, either in-field or at the Command Post (typically working with the Wildlife Branch Director or the Planning and Operations sections as appropriate. Sea Alarm staff will act in a technical advisory role at the incident management level and will work impartially with all parties (titleholder, local authorities, mobilised experts and local experts, and response groups), with the aim of maximising the effectiveness of the wildlife response.

Through OSRL's ongoing funding of the Global Oiled Wildlife Response System (GOWRS) Project, a wildlife assessment team of four wildlife experts can be mobilised in-field for up to four days in addition to the Sea Alarm resources noted above. The GOWRS Oiled Wildlife Assessment Service is a ready-to-deploy 4-person team delivered by a network of 10 leading wildlife response organisations. The four-person team will initially deploy for four days to provide an on-the-ground technical assessment of wildlife response needs and the professional capabilities of local responders. The team will inform the client of the feasibility of a full-scale professional response and the details of the GOWRS expertise that is available to deliver to the scale of such a response. There is also access to additional oiled wildlife resources on a 'reasonable endeavours' only basis through the GOWRS partners.

In addition, through the SLA, Santos has the option to access OSRL's internal staff with OWR expertise (1 x UK) as part of the 18 personnel commitment for any single incident.

Appendix Q Cumulative Response Capability Assessment

Table Q-1 shows the total cumulative worst-case field response needs for the VGA-4H GI ST1 Well Suspension / Decommissioning activities. The table assesses the cumulative requirement for personnel based on the predicted requirements from the worst-case resourcing for each response strategy. Note: During a real event, resourcing may be different to that listed in the table, based on an operational NEBA. This information is presented for assessment purposes only, to ensure adequate resources are available for worst-case response strategy implementation. The information provided in Table Q-1 is conservative as it assumes that all response strategies are deployed simultaneously.

The personnel numbers in Table Q-1 represent the estimated worst-case operational requirements. Additionally, it is assumed the total number of personnel required would be ~50% greater to cover shift arrangements to manage responder fatigue. It is estimated that a total of 123 trained field response personnel will be required throughout the response, including allowing for shift changes. Additional personnel requirements where needed will be resourced through a combination of:

- ad-hoc training for specific response strategy needs
- sourcing additional personnel from OSROs on a case-by-case/ best endeavours basis.

Table Q-1: Cumulative response capability assessment

Function	Response strategy	LOWC scenario response need requirement	Capability to meet VGA-4H GI ST1 Well Suspension / Decommissioning requirement*				
			Santos	AMOSC staff	Industry Core Group	OSRL	Mutual aid, contractors and service providers
Source control ¹		39	39 ²	-	-	-	Additional personnel available from WWCI and Oceaneering ³
Monitor and Evaluate	Vessel surveillance	2 vessel crew	-	-	-	-	2 vessel crew
	Aerial surveillance ⁴	2 aerial observers 1 flight crew	-	1 aerial observer	1 aerial observer	-	1 flight crew
	Tracking buoys	1 vessel crew	-	-	-	-	1 vessel crew
	Oil spill trajectory modelling	<i>Services provided with no specific personnel numbers required.</i>					
	Satellite imagery	<i>Services provided with no specific personnel numbers required.</i>					
Containment and recovery (as per Table 12-5)		18 (2 C&R systems, each with 2 vessel masters, 2 supervisors, 4 deployment crew, 1 deckhand)	-	2 C&R supervisors	-	2 C&R supervisors	Vessel contracted: Vessel masters (4), deployment crew (8) and deckhands (2)
Mechanical dispersion		<i>N/A – personnel as per vessel availability</i>	-	-	-	-	As per in-field vessel availability
Chemical dispersant application	Vessel-based application as per Table 13-5	2 vessels (2 vessel spray systems, each with 1 vessel master, 2 supervisors, 1 deckhand)	-	2 vessel dispersant supervisors	-	2 vessel dispersant supervisors	Vessel contracted: Vessel masters (2) and deckhands (2)
	Surface application: Aircraft systems as per Table 13-8	12 personnel total	-	1 Air Attack Supervisor	-	-	FWAD Contract: 10 Air Attack aircraft pilot + 1 st Officer (Santos-contracted): 2
Shoreline protection and deflection	Protection and deflection resources as per Section 14.3.	41 protection and deflection supervisors 369 Protection and deflection operatives 82 shallow-draft vessel crew (41x skipper, 41x deckhands, 41 vessels).	2 protection and deflection supervisors	-	36 protection and deflection supervisors	3 protection and deflection supervisors	Labour hire Up to 2,000 team members available, working under direction of team leader (contracted workforce hire company). Vessel personnel - contracted.
Shoreline clean-up	Shoreline Clean-up Assessment (SCAT) resources	15 teams (with 1 team leader and 1–2 team members)	2 SCAT team leaders	-	13 SCAT team leaders	Available on request	Up to 2,000 team members available, who can complete shoreline assessment training, working under

Function	Response strategy	LOWC scenario response need requirement	Capability to meet VGA-4H GI ST1 Well Suspension / Decommissioning requirement*				
			Santos	AMOSC staff	Industry Core Group	OSRL	Mutual aid, contractors and service providers
	as per Appendix M (Table M-2)						direction of team leader (contracted workforce hire company).
	Shoreline clean-up resources as per Table 15-5	56 teams: 56 shoreline clean-up supervisors ⁵ 280 team members	-	-	10 shoreline clean-up supervisors	5 shoreline clean-up supervisors	Labour hire Up to 2,000 team members available, working under direction of team leader (contracted workforce hire company). Vessel personnel - contracted
OWR	Refer to Appendix P. Sourced as per the WAOMP arrangements (high predicted impact) (DBCA, 2022a)						
Waste management		<i>N/A – personnel as per shoreline clean-up and OWR resourcing</i>	-	-	-	-	WSP to provide personnel under existing contract to collect and transport waste
OSM components (excluding SCAT)			Refer to North West Shelf OSM-BIP (7715-650-ERP-0002)				
Response need (excluding Source Control)			4	6	60	12	
Response need including +50% for shift change			6	9	90	18	
Total Available (excluding Source Control)			22 ⁶	12 ⁷	121 ⁸	18 ⁹	Additional personnel available from WWCI and Oceaneering
Total Required for Source Control			39	-	-	-	

* The resourcing in this table is for illustrative purposes only. Roles may be resourced differently from the range of OSROs Santos has access to according to the circumstances and requirements of the incident, and may be swapped accordingly between IMT/field roles.

1. The cumulative capability for Source Control is assessed on its own, as the resources do not impact other strategy implementation. 60 Santos source control personnel available.
2. It is estimated that 10 of these Source Control personnel would be required for IMT scale-up roles.
3. WWCI has confirmed availability of 34 source control personnel.
4. Based on 1 aircraft conducting 2 aerial surveillance sorties per day.
5. Note, the same teams used for protection and deflection will subsequently be tasked with shoreline clean-up operations, therefore, a further 15 trained supervisors are identified in shoreline clean-up, to make a total of 56 trained oil spill response personnel.
6. Santos field personnel made up of 16 AMOSC Core Group members based across Perth, NW Australia and South Australia, and 6 IMO1 trained personnel based in Darwin.
7. AMOSC has a permanent staff of 16 available on a 24/7 basis (AMOSPlan 2021), 12 of which are available for field response, and 4 for admin/management support roles.
8. A total of 121 personnel in the Core Group as of January 2026 (AMOSC Member's website).
9. 18 trained oil spill responders guaranteed. A pool of 80 dedicated spill response specialists approved on a case-by-case basis.

Appendix R IMT Resourcing

Santos uses ICS as its Incident Management System for managing Level 2/3 incidents. This system ensures a structured and scalable approach to incident response with all roles and responsibilities as detailed in the Santos Incident Management Handbook.

To maintain the required level of IMT capability at all times, Santos has established a suite of supporting documents and tools. The two key resources are:

- Santos Incident Management Resourcing Guideline - WANATL (7700-670-GDE-0012);
- Santos IMT Resourcing Register.

The Santos Incident Management Resourcing Guideline – WANATL (7700-670-GDE-0012) defines the IMT roles required for various time periods and outlines resourcing assumptions, while the IMT Resourcing Register tracks the availability of IMT personnel through internal and external arrangements.

The IMT resourcing assessment for Santos, as detailed in the Santos Incident Management Resourcing Guideline - WANATL (7700-670-GDE-0012), involves two steps:

1. Define the IMT roles required at defined time periods;
2. Determine the number of personnel required for each of the IMT roles to manage the incident response during the defined time periods.

The defined time periods, associated incident response phases, and corresponding IMT roles established for the purposes of resourcing assessment are as defined in Table R-1.

Table R-1: Indicative Time Periods and IMT Roles

Indicative Time Periods	Incident Response Phases	IMT Roles Required
~ 0 to 48 hrs	Initial Response Phase	Core Team
~ 48 hrs to 5 days	Escalation Phase	Support Team
~ 5 days and beyond	Long-Term Response Phase	Scale up Team

These phases are intended as guidelines and may be adapted according to the complexity of the incident and operational requirements.

IMT Core and Support Teams

Core Team roles are activated for all Level 2 and Level 3 incidents and are staffed by Santos’s personnel to provide initial response support. IMT Support Team roles comprise additional roles beyond those of the Core Team, which are also filled by Santos personnel when supporting Level 2 or Level 3 incidents. The number of IMT personnel required for Core Team and Support Team roles is established based on the following assumptions:

- For a Level 2/3 incident, 2 x 12-hour operational periods per day may be required. Some IMT roles may be required for both the operational periods per day while others may be required only for 1 x 12-hour operational period per day (e.g., Day Shift). This is defined as “Shift Cover” for the purpose of IMT Resourcing Assessment.
- Based upon the nature and scale of the incident, roster rotation may be required and will be based on a 1 week on / 1 week off schedule. This is defined as “Rotational Roster Cover” for the purpose of IMT Resourcing Assessment.

Table R-2 and Table R-3 summarise the resourcing assessment for IMT Core Team and IMT Support Team, based on the above assumptions.

Table R-2: IMT Resourcing – Core Team

#	Type	IMT Role	Resourcing Needs Assessment				Number of Santos Personnel Available
			Shift Cover		Rotational Roster Cover	Number of Personnel Required	
			Day Shift	Night Shift			
1	Core	Incident Commander	1	1	4	4	5
2	Core	Safety Officer	1	0	2	2	3
3	Core	Legal Officer	1	0	2	2	3
4	Core	HR Officer	1	0	2	2	3
5	Core	Public Information Officer	1	0	2	2	3
6	Core	Operations Section Chief	1	1	4	4	5
7	Core	Planning Section Chief	1	1	4	4	5
8	Core	Environment Unit Leader	1	1	4	4	5
9	Core	Situation Unit Leader	1	1	4	4	5
10	Core	Documentation Unit Leader	1	0	2	2	3
11	Core	Logistics Section Chief	1	1	4	4	5
12	Core	Finance Section Chief	1	0	2	2	3
Total number of personnel required for a single Operational Period (12 hrs)						12	
Total number of personnel required including Shift Cover and Rotational Roster Cover						36	
Total number of Santos personnel available						48	

Table R-3: IMT Resourcing – Support Team

#	Type	IMT Role	Resourcing Needs Assessment				Number of Santos Personnel Available
			Shift Cover		Rotational Roster Cover	Number of Personnel Required	
			Day Shift	Night Shift			
1	Support	Deputy Incident Commander	1	0	2	2	3
2	Support	Liaison Officer	1	0	2	2	3
3	Support	Deputy Operations Section Chief	1	0	2	2	3
4	Support	Recovery & Protection Branch Director	1	0	2	2	3
5	Support	Air Operations Branch Director	1	0	2	2	3
6	Support	Wildlife Branch Director	1	0	2	2	3
7	Support	Staging Area Manager	1	0	2	2	3
8	Support	Deputy Planning Section Chief	1	0	2	2	3
9	Support	Resource Unit Leader	1	0	2	2	3
10	Support	Deputy Logistics Section Chief	1	0	2	2	3
11	Support	Service Branch Director	1	0	2	2	3
12	Support	Support Branch Director	1	0	2	2	3
13	Support	Deputy Finance Section Chief	1	0	2	2	3
Total number of personnel required for a Single Operational Period (12 hrs)						13	
Total number of personnel required including Shift Cover and Rotational Roster Cover						26	
Total number of Santos personnel available						39	

Santos maintains 48 personnel within its IMT Core Team and 39 personnel for the IMT Support Team. This staffing level is determined by the roles required across both teams, ensuring adequate coverage for Shift Cover and

Rotational Roster Cover. Additionally, an extra individual per role is maintained as reserve capacity for both the IMT Core and Support Teams. The IMT Resourcing Register reflects the available Santos personnel who can support both the Core and Support Teams.

IMT Scale-up

In the event of a Level 3 oil spill incident, the IMT may need to expand beyond the Core and Support roles to include additional lead roles based on the operational and technical needs of the incident. These are referred to as Scale-up Team roles. Based on the response strategies identified in this OPEP, the Scale-up Team roles as listed in Table R-4 are reasonably anticipated to be required.

Table R-4: IMT Resourcing – Scale-up Team

#	Type	IMT Role	Number of Personnel Required	Minimum Number of Personnel Available through Santos's Arrangements
1	Scale up - DTMI Support	CMT Liaison Officer	1	1
2	Scale up - DTMI Support	Deputy Incident Controller	1	1
3	Scale up - DTMI Support	Deputy Intelligence Officer	1	1
4	Scale up - DTMI Support	Deputy Planning Officer	1	1
5	Scale up - DTMI Support	Environment Support Officer	1	1
6	Scale up - DTMI Support	Deputy Public Information Officer	1	1
7	Scale up - DTMI Support	Deputy Logistics Officer	1	1
8	Scale up - DTMI Support	Deputy Finance Officer	1	1
9	Scale up - DTMI Support	Deputy Operations Officer	1	1
10	Scale up - DTMI Support	Deputy Waste Management Coordinator	1	1
11	Scale up - DTMI Support	Deputy Division Commander (FOB)	1	1
12	Scale up - Operations	On-Water Containment & Recovery Group Supervisor	1	1
13	Scale up - Operations	Protection & Deflection Group Supervisor	1	1
14	Scale up - Operations	Dispersant Operations Group Supervisor	1	1
15	Scale up - Operations	Shoreline Response Group Supervisor	1	1
16	Scale up - Operations	Disposal Group Supervisor	1	1
17	Scale up – Source Control	Source Control Branch Director	1	1
18	Scale up – Source Control	Relief Well Operations Lead	1	1
19	Scale up – Source Control	Relief Well Engineering Lead	1	1
20	Scale up – Source Control	SIMOPS Lead	1	1
21 ⁴¹	Scale up – Source Control	Subsea Well Capping Lead	1	1
22	Scale up – Source Control	Engineering Services Lead	1	1
23	Scale up – Source Control	Source Control Logistics Specialist	1	1
24	Scale up – Source Control	Source Control Planning Specialist	1	1
25	Scale up – Source Control	Source Control Finance & Admin Specialist	1	1
26	Scale up – Source Control	Source Control HSE Specialist	1	1

⁴¹ Note: For this activity, the role of 'Subsea Well Capping Lead' is not applicable.

#	Type	IMT Role	Number of Personnel Required	Minimum Number of Personnel Available through Santos's Arrangements
27	Scale up – OSM	Monitoring Branch Director	1	1
28	Scale up – OSM	OSM Implementation Lead	1	1
29	Scale up – OSM	Operational Monitoring Coordinator	1	1
30	Scale up – OSM	Scientific Monitoring Coordinator	1	1
31	Scale up – Planning	SCAT Specialist/Coordinator	1	1
32	Scale up – Planning	Technical Specialists	1	1
33	Scale up - Logistics	Supply Unit Leader	1	1
34	Scale up - Logistics	Facilities Unit Leader	1	1
35	Scale up - Logistics	Ground Support Unit Leader	1	1
36	Scale up - Logistics	Vessel Support Unit Leader	1	1
37	Scale up - Logistics	Communications Unit Leader	1	1
38	Scale up - Logistics	Food Unit Leader	1	1
39	Scale up - Logistics	Medical Unit Leader	1	1
40	Scale up - Finance	Cost Unit Leader	1	1
41	Scale up - Finance	Time Unit Leader	1	1
42	Scale up - Finance	Procurement Unit Leader	1	1
43	Scale up - Finance	Compensation/Claims Unit Leader	1	1
44	Scale up - Finance	Administrative Unit Leader	1	1
Total number of personnel required			44	

Note: For this activity, the role of 'Subsea Well Capping Lead' is not applicable.

Santos has established various external arrangements to fulfill the capability requirements for these Scale up team leader roles and their team members, as outlined below:

- AMOSC Participant Member Agreement;
- Industry Mutual Aid / Core Group Personnel;
- OSRL Associate Member Agreement;
- TRG Contract;
- Specialist Service providers including;
 - WWCI: for Source Control support;
 - RPS: For oil spill modelling/visualization support;
 - Monitoring Services through OSRL's OSM Supplementary Service Agreement;
 - NWA: Waste Management Contractor – North West Shelf;
 - Veolia: Waste Management Contractor – Northern Australia;
 - TOLL: Logistics Services Contractor;
 - Aspen: Medical Services Provider;
 - Recruitment Services provider / Labour Hire Companies.

Santos is a Participating Member of AMOSC. This arrangement provides Santos with access to 16 AMOSC staff and at least 84 AMOSC Core Group personnel⁴² under the AMOSPlan for support in the event of an oil spill incident.

Santos is also an Associate member of OSRL. Under the membership Service Level Agreement, Santos has guaranteed access to oil spill response support including 18 OSRL personnel to support IMT and/or field response roles. OSRL maintains a global pool of 80 dedicated responders and access to these additional resources may be available on a case-by-case basis.

Santos also maintains a contract with TRG, a specialist incident management services provider for IMT support for long duration, complex and sustained IMT operations. In the event of a Level 2/3 oil spill incident, TRG will be mobilised to provide Incident Action Planning (IAP) support and to operate and manage the IAP software for Santos. Through the contract with TRG, Santos has access to 60 TRG personnel who can be called upon for support in the event of an oil spill incident.

In addition to the above, recognizing that certain incidents may require the use of technical specialists who have specialized knowledge or expertise, Santos also maintains various arrangements to gain access to specialist services providers as listed above. Overall, Santos can draw upon a pool of personnel through external arrangements to fulfill the Scale-up requirements. The IMT Resourcing Register monitors Scale-up role requirements and available personnel through external arrangements, ensuring that all IMT staffing needs are effectively fulfilled.

The personnel requirements through Santos arrangements have been checked against the Cumulative Response Capability Assessment in Appendix Q to ensure that both the field requirements and IMT requirements can be met.

⁴² Target to maintain at least 100 members [minimum 84, maximum 140] as per AMOSC Core Group program and policies V2.0. A total of 121 personnel in the Core Group as of January 2026 (AMOSC Member's website).